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Volume 77 Number 7

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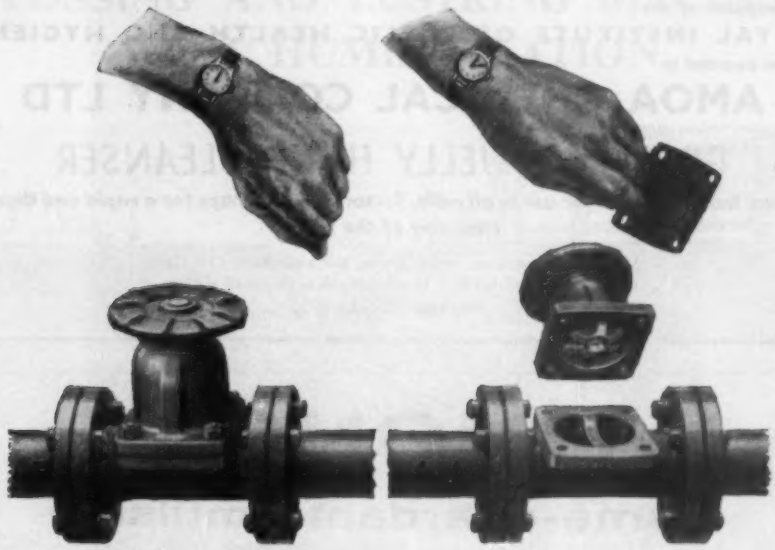

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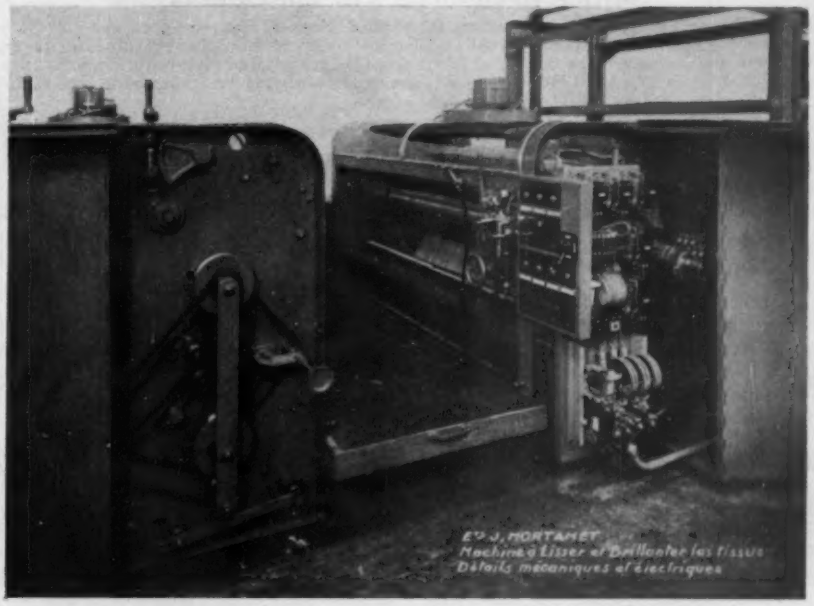

This glossing and lustring machine, the only one constructed in Europe which can deal with all types of material, is made by Etablissements MORTAMET, of Villeurbanne, France. It was invented by their Director, Monsieur FAYARD, who had experience in the construction of machines for the transformation of ordinary sheepskin into gilded sheepskin.

This machine can be used by manufacturers of plush made from all types of material, wool or synthetic fibres. It gives spectacular results with ladies' woollen, dress and coating materials.

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The glossing machine itself has a stretching worm screw made of stainless steel to ensure that the cloth when it comes into contact with the cylinder is free from creases.

The cloth is pressed on to the cylinder by means of an endless felt which moves at exactly the same speed as the advancing material.

This endless felt can apply the material to the cylinder over a very short length when used, for example, for plushes but when the machine is used for woollen cloth, this felt can press the material on to the cylinder over a length of nearly 30 cm. The pressure is infinitely variable, and is regulated by means of a manometer. Pneumatic jacks make it possible to apply or detach the material instantaneously.

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Forthcoming Papers

The following papers have been accepted by the Publications Committee, and will appear in future issues of the *Journal*—

LECTURES

Development of a new Shrink-resist Finish	*A. N. Davidson*
Legal and Practical Problems of Effluent Disposal	*J. H. Harwood*
Chemistry of Thermosetting Resins and Related Compounds	*A. R. Smith*

COMMUNICATIONS

Setting of Animal Fibres in Solutions of Thiourea Dioxide	*L. S. Bajpai and C. S. Whewell*
Effect of Sulphuric Acid on Wool. V— Investigation of Dyeing Faults caused by Carbonising	*R. L. Elliott, R. S. Asquith, and B. J. Jordan*
Further Tests for Colour Vision	*F. Jordinson*
A Study of the Chemistry of Carrotting Processes— Parts I–III	*E. A. Robinson and J. Robinson*

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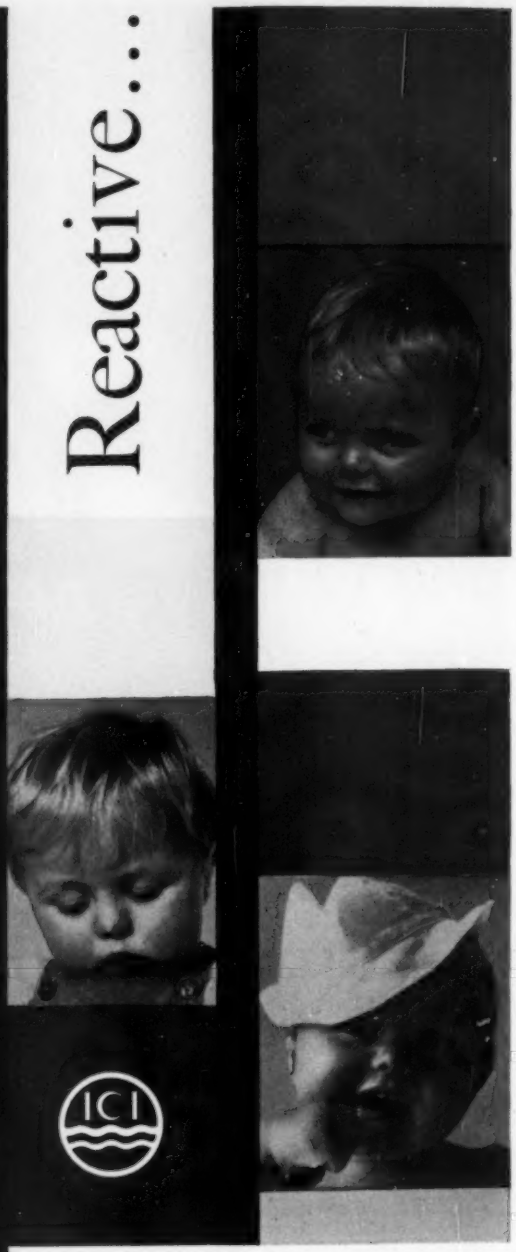

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E. E. Bowker	H. R. Hadfield	K. Meldrum	W. Shaw
M. R. Fox	N. Hamer	R. H. Peters	A. K. Taylor
J. Greenwood	A. Johnson	J. W. Reidy	H. A. Turner
			J. S. Ward

Honorary Secretary W. R. LEIGH, 1 Grange Road, Bromley Cross, Bolton, Lancs.

MIDLANDS

Chairman J. C. WRIGHT *Vice-chairman* A. S. CLULEY

Committee

B. B. Brewer	A. P. Kershaw	*W. Penn	G. Whitehead
T. E. Charlesworth	W. L. Langton	R. W. Richardson	D. B. Williamson
D. O. Douglas	W. L. Lead	J. Saunders	
D. R. Graham	C. A. Mills	L. A. Telesz	

(* *ex officio* member)

Honorary Treasurer R. GREENLEES, 49 Rochester Road, Earlsdon, Coventry
Honorary Secretary J. RAYMENT, 53 Grove Avenue, Chilwell, Notts.

NORTHERN IRELAND

Chairman W. J. WATTS *Vice-chairman* N. HINDSHAW

Committee

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G. E. Charles	J. Kershaw	W. J. Macnab	S. G. Walker
			T. H. Wood

Honorary Treasurer N. HINDSHAW, 9 Kings Park, Knock, Belfast
Honorary Secretary J. PORTER, 22 Rosemary Park, Malone, Belfast

SCOTTISH

Chairman I. GAILEY *Vice-chairman* B. W. MILLS

Committee

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H. R. Crone	C. H. Giles	J. G. B. McCallum	P. Schwarzenbach
I. F. Y. Dick	J. H. Jackson	R. McDonald	G. W. Thomson

Honorary Treasurer W. P. EDMONDSON, 12 Westwood Avenue, Giffnock, Renfrewshire
Honorary Secretary F. ATACK, 6 Banavie Road, Glasgow W.1

WEST OF ENGLAND AND SOUTH WALES

Chairman A. S. LEVESLEY *Vice-chairman* S. SHAW

Committee

E. Dean	A. C. Gilbert	M. Magnew	G. Welford
K. Foster	F. Jamieson	T. J. S. Smith	J. W. Young

Honorary Treasurer E. HOLDEN, Cabot House, Clifton Down Road, Bristol 8
Honorary Secretary J. N. LITTLER, *c/o* I.C.I. Ltd., 35 Queen Square, Bristol 1

WEST RIDING

Chairman S. R. COCKETT *Vice-chairman* F. F. ELSWORTH

Committee

B. C. Burdett	R. K. Fourness	C. W. Green	K. A. Hilton
C. O. Clark	J. Furniss	R. Heaton	J. G. Hopkinson
*J. Elliott	J. M. Goodall	*W. R. Hermes Jnr.	E. Rowling

(* *ex officio* member)

Honorary Secretary ESMÉE SMITH (Miss), Flat 16, Foxhill, Weetwood Lane, Leeds 16

BRADFORD JUNIOR BRANCH

Chairman E. N. WOOD *Vice-chairman* C. T. HARDISTY

Committee

G. Button V. L. Elsworth

Honorary Secretary W. R. HERMES Jnr., 69 Manston Way, Crossgates, Leeds 15

Assistant Secretary I. CARTER

LEEDS JUNIOR BRANCH

Chairman B. PILLING *Vice-chairman* J. D. JENNISON

Committee

G. Blacker	J. D. Hildreth	D. M. Lewis	J. H. Pierce
H. S. Green			

Honorary Secretary M. FRANKS, 26 Burnwells, Thackley, Bradford

MANCHESTER JUNIOR BRANCH

Chairman F. V. DAVIS *Vice-chairman* R. H. PETERS

Committee

R. D. Ellor	W. S. Hickman	D. P. Oulton	F. Porter

Honorary Secretary A. P. LOCKETT, College of Science and Technology, Manchester 1

MIDLANDS SECTION LEICESTER JUNIOR BRANCH

Chairman W. FURNESS

Committee

R. Charlesworth	D. Constant	*W. A. Edwards	*J. Rayment
*A. S. Cluley	J. Dickman	K. Gresswell	*J. C. Wright

(* *ex officio* member)

Honorary Secretary J. A. HAWKES, 46 Newbold Road, Desford, Leicestershire

MIDLANDS SECTION NOTTINGHAM JUNIOR BRANCH

Chairman C. BROUGHTON *Vice-chairman* S. RANDLE

Committee

D. F. Cooper	R. Hall	*J. Rayment	B. Stevenson
B. Creasey	G. J. Murfet	P. Schnieder	*J. C. Wright

(* *ex officio* member)

Honorary Treasurer D. BLOWER

Honorary Secretary D. THOMAS, 3 Huntingdon Drive, The Park, Nottingham

SCOTTISH JUNIOR BRANCH

Chairman W. A. BLUE *Vice-chairman* A. H. MATTINSON

Committee

*F. Atack	*I. Gailey	*B. W. Mills	J. J. H. Storm
*W. P. Edmondson	A. M. Love	C. McNeil	

(* *ex officio* member)

Honorary Secretary R. MCDONALD, Westlea, 24 Methuen Road, Paisley, Scotland

AFFILIATED SOCIETIES

THE SOCIETY OF DYERS AND COLOURISTS OF AUSTRALIA

President	Frank Forster
Immediate Past President	E. I. Noble
Honorary General Treasurer	W. C. Castle
Honorary General Secretary	J. Brear c/o ICIANZ Ltd. I.C.I. House 1 Nicholson Street Melbourne
Publications Editor	R. S. Mayston

Section Committees

VICTORIAN

Chairman	J. D. Harkness
Vice-chairman	P. B. Law
Honorary Secretary	R. L. Runting
Assistant Honorary Secretary	B. R. Bennie
Honorary Treasurer	R. H. Brereton
Counsellor	T. F. Hall
Honorary Librarian	R. S. Mayston
Committee	L. Crawshaw, T. F. Hall, F. R. B. Knight, A. G. Morrison, and A. G. Munro

GEELONG (SUBSECTION)

Chairman	R. B. Sweetten
Honorary Secretary	E. C. Foster
Honorary Treasurer	Miss L. Hill

SOUTH AUSTRALIAN

Chairman	S. G. Pike
Vice-chairman	J. Allen
Immediate Past Chairman	E. Voitkuns
Honorary Secretary	R. P. Crook
Assistant Honorary Secretary	H. D. Bruce
Honorary Treasurer	I. Emslie
Honorary Librarian	H. D. Bruce
Committee	J. Burns, J. Davids, B. Forsyth, L. Way, and G. Wood

NEW SOUTH WALES

Chairman	W. F. Rogers
Vice-chairman	L. L. White
Immediate Past Chairman	H. W. Senior
Honorary Secretary	J. Gough
Assistant Honorary Secretary	J. C. Hardy
Honorary Treasurer	F. Scully
Counsellor	J. A. Eastwood
Honorary Librarian	F. Eastwood

QUEENSLAND

Chairman	J. Robb
Honorary Secretary	A. R. Ferrier
Assistant Honorary Secretary	J. Olgilvie
Honorary Treasurer	P. Hogg
Committee	J. Curtis, D. Lenton, F. Mattingly, N. Robinson, and H. Turle
Honorary Auditors	J. Everett, H. Scott

WEST AUSTRALIAN

Chairman	W. Donovan
Vice-chairman	C. J. Cocks
Honorary Secretary and Treasurer	C. W. Cruickshank
Committee	F. Deleon, J. R. Edinger, N. Parker, H. Theaker, and C. Waddington

NEW ZEALAND

Chairman	A. C. Miller
Vice-chairman	G. Bevins
Honorary Secretary	C. J. Ward
Assistant Honorary Secretary	A. G. Stubbs
Honorary Treasurer	W. Mayor
Counsellor	G. Bevins

CANTERBURY (SUBSECTION)

Chairman	K. White
Vice-chairman	R. Grundy
Honorary Secretary and Treasurer	R. D. Walker
Committee	J. S. Ellis R. L. Hutchinson

DYERS AND COLOURISTS ASSOCIATION OF SOUTH AFRICA

P.O. Box 930, Durban

Chairman	J. A. Allen
Vice-chairman	E. Hipperson
Secretary	G. H. Hayward
Treasurer	E. Cullis
Committee	E. Cornah and B. Farmer

Retiring President's Message

THE office of President of our Society, while carrying many privileges, honours and duties, permits also a view of our standing in the scientific and technical world which is both heartening and sobering.

Not only do I see the pattern of past voluntary service which, over the years, has built us up to the present healthy and useful position we hold, but I see also the continued effort we shall need to make if we are to keep faith with our heritage and tradition. Even more of our time, thought, and conscious striving to serve will be called for, if we are to play our proper part in the expanding national and international field.

The rapidly shrinking world, yet its ever widening contacts, calls for emphasis once again on the importance of being able to communicate in languages other than our own: we shall take the easy way at our peril. It is to be hoped that the International Relations Committee of the future will be composed of our own members who are linguists by practice, just as they are scientists and technicians by profession.

Education clearly plays its part in preparation for these services to the common good: the Society is alive to the opportunity, and aware of its responsibility in this. The new steps it is taking augur well for our future.

The Petition for a Royal Charter has been prepared and is being presented and, if granted, we shall be encouraged and heartened in the many fields of colour science and technology in which we move.

But our range and effectiveness will be seriously limited unless we can rely on the goodwill and active support of the heads of organisations and firms in the varied fields we serve.

Many such men already give us their practical help in diverse ways and we acknowledge this and thank them sincerely.

To those who do not yet face their obligation I would appeal— consider the pattern of the future and encourage your staff to do likewise by showing your own interest in the aims and work of the Society, for only so can we go from strength to strength.

Finally, I tender my sincere thanks to all Honorary Officers, Members of Council, Officials and Staff, for the considerable help and assistance they have given me during a very happy year as President.

F. Stevenson.

April 1961

Proceedings of the Society

Annual General Meeting

The Seventy-seventh Annual General Meeting of the Society of Dyers and Colourists was held at the Midland Hotel, Manchester, on Friday, 28th April 1961, at 3.45 p.m., the President (Mr. F. M. STEVENSON) being in the chair, and 77 members of the Society being present.

1. NOTICE CONVENING THE MEETING

The General Secretary read the Notice convening the meeting.

2. MINUTES OF THE SEVENTY-SIXTH ANNUAL GENERAL MEETING HELD ON 29TH APRIL 1960

The adoption of the Minutes of the Seventy-sixth Annual General Meeting, held at the Queen's Hotel, Leeds, on 29th April 1960, previously circulated, was proposed by Mr. J. RANKIN, Immediate Past Chairman of the West Riding Section, and seconded by Mr. H. W. TAYLOR, Honorary Secretary of the London Section.

Mr. H. FOSTER, a former Vice-president of the Society, considered that the Minutes did not truly reflect the feeling of that meeting; he had made criticisms concerning the finances of the Society, its growth, and the growth of its expenditure which had not been included, and other comments had not been adequately reported. Mr. J. W. REIDY, a Member of Council, expressed the view that the substance of Mr. Foster's criticisms should have been recorded.

The President pointed out that the Minutes had been approved for circulation and the report of the proceedings of the Annual General Meeting was published in the July 1960 issue of the *Journal* and this was the first he had heard of any comment or disagreement.

Having noted the comments but without any formal amendment having been made, he now put the proposal for adoption. The proposal was carried.

3. ANNUAL REPORT OF THE COUNCIL OF THE SOCIETY

Honorary Service to the Society

The Council of the Society, in presenting this report, wishes to express thanks to the many members in all sections of industry and in the academic sphere who give so generously of their time and experience in service on committees and sub-committees, and in many other ways, in a united effort to stimulate and develop the Society's activities, which are devoted to the Sciences of Colour.

Development in the Sciences of Colour

The aim of the Society is to keep abreast of scientific and technical developments in the colour-making and colour-using industries, and in academic fields, in the United Kingdom, the Commonwealth, and elsewhere. The motto "Scientia Coloris Ministra" on the Society's Coat of Arms should inspire us all to still greater effort to fulfil this aim.

Petition for Royal Charter

Council has for some time had under consideration the desirability of presenting a Petition to Her Majesty the Queen for the Grant of a Royal Charter of Incorporation to the Society. Council caused to be prepared a draft Petition and Charter and by Resolution authorised the presentation of the Petition subject to the approval by Members in General Meeting. These proposals were placed before Members at an Extraordinary General Meeting convened for the purpose, when the documents were approved without dissent and the Society's solicitors were given authority to proceed with the presentation of the Petition.

New Year Honours

Council congratulates Mr. Alan Herries Wilson, M.A., F.R.S., a Deputy Chairman and Managing Director of Courtaulds Limited and a member of the Society since 1946, on receiving a Knighthood in the 1961 New Year Honours.

Society Honours

Council has been pleased to make the following awards—

Gold Medal	W. A. Edwards (Loughborough)
	W. Penn (Coventry)
Silver Medal	R. Grice (Burley-in-Wharfedale)
	E. I. Noble (Australia)
	C. B. Stevens (Leeds)
Bronze Medal	F. Harrison (London)

The Research Medal of the Worshipful Company of Dyers of the City of London has been awarded to Dr. J. Wegmann for his paper on the "Effect of Structure on Change of Colour of Vat Dyes on Soaping", published in the *Journal* in May 1960.

Social

At the Annual Dinner of the Society on 29th April 1960 at the Queen's Hotel, Leeds, Sir Donald Kaberry, Bt., T.D., M.P., proposed the toast to the Society and The Right Honourable Lord Milner of Leeds, P.C., M.C., T.D., responded for the guests.

On behalf of the Society, Council extended congratulations to The Royal Society on the tercentenary of its foundation and presented an illuminated address.

The Sections have promoted many enjoyable social functions which are very much appreciated, as shown by the increasing support of members and their friends.

The Society's Eighth Annual Golf Competition was held at Buxton on 26th May 1960. The winner of the Goodall Trophy was Mr. G. V. W. Kendell, of Manchester, who received a miniature silver cup.

Finance

The increasing activities of the Society under conditions of rising costs have necessitated the continued scrutiny of expenditure and it became apparent that steps must be taken to increase revenue. This has been done and Council records

appreciation of the helpful response by all concerned. At the same time, expenditure has been restricted without detriment to the Society and its members.

The outcome of this policy is not apparent in the year under consideration, but will be clearly recognisable in the improved financial position of the Society next year. Moreover, although there have been deficits during the past few years, it has not been necessary to realise any of the Society's investments, all of which remain intact.

Education

During the three-quarters of a century of its existence the Society has become recognised as a progressive influence in stimulating and developing education in the arts and crafts of coloration and in all branches of the science of colour. Council has therefore been drawn more and more into the formulation of educational policy and its implementation. This is reflected in the increasingly valuable work of the Diplomas Committee and its Examinations Board, whose members are to be congratulated on the growing roll of Fellows and Associates of the Society. In the year under review fourteen Fellows and twenty-two Associates were elected. In furtherance of its educational policy, Council recently set up an Education Committee to plan and guide educational activities. It is believed that this committee will be of great service in moulding courses of study for young entrants into the colour-making and colour-using industries.

The Society's educational activities included lectures to the Sections and Junior Branches. In particular, Junior Members resident in the West Riding of Yorkshire have much appreciated the prizes awarded by the Dyers and Finishers Association for an essay competition. A very successful Summer School, lasting one week, was held in Manchester on *Fastness and Fastness Testing*. A half-day symposium in Bradford on *New Dyeing Techniques*, and another in Nottingham on *Chemical Finishing*, attracted a good attendance. Council particularly expresses thanks to lecturers, colleges, technical institutions, firms, and all others who have made valuable contributions, in this work and in many other diverse and practical ways, in service to the Society.

Mention should also be made of two other notable events, the Sixth George Douglas Lecture, which was held on 13th October 1960 in the Midland Hotel, Bradford, on *Wool as a Fibre in Dyeing and Finishing*, and the Eighth London Lecture, on *Colour and Design in Dress Fabrics*, held on 21st October 1960 in the Waldorf Hotel, London. The lecturers on these important occasions were, respectively, Dr. A. B. D. Cassie and Mr. S. J. R. Leeming, who are especially thanked by Council.

Council records appreciation of the invitation which was received from the Council of the Royal Institute of Chemistry, with the concurrence of the Ministry of Education, to nominate an Associate Assessor for the Joint Committee for National Certificates for England and Wales. Dr. C. H. Giles, a Senior Lecturer of the Royal College of Science and Technology, Glasgow, was appointed to be the Society's Associate Assessor in dyeing and related technology for National Certificates and Diplomas in Applied Chemistry in England and Wales. A similar function in regard to Scottish National Certificates is discharged by Mr. F. Jordinson, a Senior Lecturer in charge of Dyeing at the College of Technology, Huddersfield.

Publications

The flow of Proceedings and Communications has been maintained in the *Journal*. Great credit is due to the Acting Editors and to the Publications Committee for upholding the usual high standard of publication during the difficult period of the changeover of editors. Council records thanks to all who have contributed to the *Journal* and its production, and extends a welcome to Dr. M. Tordoff, the new Editor.

The *Colour Index* is still in great demand and the issue of lists of Additions and Amendments continues. The Editorial Board is preparing a Supplement which, it is hoped, will appear in 1962. Council congratulates the Board on the most satisfactory world-wide co-operation achieved in this work.

Scientific Tests Concerning Colour

The Society's activities have their foundation in the science of colour. In contributing to these activities, the Fastness Tests Co-ordinating Committee, with the active assistance of the experienced members of its subcommittees, has operated with distinction. The Second Edition of *Standard Methods for the Determination of the Colour Fastness of Textiles* was published during the year, and the British Standards Institution revised its equivalent Standards to bring them into line.

The production of Grey Scales is now to be more rigorously controlled, since colorimeters of much greater sensitivity are now available. The British Standards Institution is assisting the Society in the distribution of these Scales.

The Government Committee on Consumer Protection (the Molony Committee) invited the Society to submit comments on the problem posed by the existence of complaints relating to fading or running of colours. The detailed reply stressed that the Society was the body responsible for devising fastness tests whilst the British Standards Institution was responsible for devising standards of performance which employed the Society's fastness tests.

All the subcommittees have been very active this year helping in the formulation of specific tests designed to overcome the many problems submitted to the Society.

The Society is also taking part in the work of committees which have been set up to consider the effects of carpet shampoos and cleaners.

The practical work of all committees in this branch of the Society's activities merits the high regard of Council, whose thanks are recorded on behalf of the many interests concerned.

Commonwealth and International Relations

Friendly co-operation with the Society of Dyers and Colourists of Australia has been marked by the increased membership of this Society since a closer mutual working agreement was entered into. In

South Africa expansion of the Society's interests is also progressing.

The Canadian Association of Textile Colourists and Chemists and this Society collaborate in matters of mutual interest, including the exchange of technical papers. Congratulations from the Council of the Society were sent on the occasion of the 25th Anniversary of the Canadian Association on 6th February 1960.

The Society's membership of the International Federation of Associations of Textile Chemists and Colourists continues to strengthen the bonds and to promote understanding and closer working with other countries.

The cordial relations between the Society and the American Association of Textile Chemists and Colorists are particularly in evidence in the work on the *Colour Index*.

In the efforts to maintain good relationships with other countries, Council is mindful and appreciative of the activities of the Society's International Relations Committee.

Sections and Junior Branches

The Annual Conference of Officers of Sections and Junior Branches preceded the Annual General Meeting of members of the Society. The Honorary Secretary, Mr. L. Morton Wood, presided over a discussion in which views were exchanged on a wide range of subjects; such exchanges are of great value to the well-being of the Society. The Honorary Treasurer spoke about the Society's financial position and how Sections could help to implement the proposals for improving it. This Annual Conference of Officers of Sections provides an excellent opportunity for raising matters which are likely to be of interest to all Sections.

Throughout the Sections 1960 was a very busy year, and the thanks of Council are extended to all the Officers and members of local committees who have so praiseworthily contributed to the great success of the Sections and their Junior Branches.

Council congratulates the Midlands Section on the formation of the Leicester and Nottingham Junior Branches.

A special tribute is paid to the Honorary Secretaries of Sections, including Junior Branches, who continue to devote considerable time and energy to the Society for which Council and all the members of the Society are extremely grateful.

Representation on External Bodies

Council very much appreciates the work of the Society's representatives on external bodies, who continue to be active.

Membership and Administration

Members of the Society and *Journal* subscribers now total 4724, an increase of 235 over last year.

The Society has recently lost some eminent members who have given very valuable service. Among them were two Past Presidents, Dr. C. J. T. Cronshaw and Dr. C. M. Whittaker, and Council pays warm tribute to their long and devoted services to the Society. The death of the Chairman of the Northern Ireland Section, Mr. Will Graham, was a great loss to the Section and to Council, and in the passing of the Vice-chairman of the West of England and South Wales Section, Mr. Dick Carter, the Society has lost a friend and member of long standing.

In conclusion, the President, the Honorary Officers and Council wish to record the great appreciation felt by all for the valuable work which has been done by the General Secretary, the Editor and the Staff in their united and loyal service to the Society.

* * *

Mr. L. M. Wood, Honorary Secretary, presented the Annual Report of Council, which had been circulated. He drew attention to the new layout which gave a more general picture of the activities of the Society.

Expressing the appreciation they all felt for the amount of voluntary work undertaken on behalf of the Society, Mr. Wood conveyed thanks to all who contributed in this manner.

He referred to the newly formed Education Committee, which had undertaken an important role, and he wished it well. At the Society's 1961 examinations there would be 96 candidates from the British Isles and from overseas.

The Editor of the *Journal*, Dr. M. Tordoff, who had joined the Society in August 1960, was now contributing to the smooth working of the *Journal* and he had the Society's good wishes.

A highlight of the year's events had been the presentation of Medals and Awards at Bradford, when about 160 members, relatives, and friends had been present at a very successful ceremony.

Paying tribute to the retiring President, Mr. F. M. Stevenson, for his efforts on the Society's behalf during his term of office, Mr. Wood included Mr. Stevenson's sons and the executives of his organisation for making this possible.

Concluding, Mr. Wood expressed thanks to the officials and staff of the Society, whose services were much appreciated.

He formally moved the adoption of the Annual Report of Council.

The proposal was seconded by Mr. R. C. Oakley, Vice-chairman of Council, and carried unanimously.

4. Presentation of Balance Sheet, Statement of Accounts, and Auditors' Report for the Year Ended 31st December 1960

The Honorary Treasurer, Mr. A. Waddington, in presenting the Accounts, referred to the deficit of £4,148 and recalled that at the last Annual General Meeting he had envisaged such a deficit.

During the year the Finance and General Purposes Committee had proposed, and the Council had implemented, increased rates for *Journal* subscriptions and advertising, which did not, however, affect the 1960 accounts. The recommendations of the Committee would avoid a deficiency in the year 1961. A further number of proposals would benefit finances without affecting efficiency. The work in effecting economies and increasing income was not yet complete, although

Balance Sheet as at 31 December 1960

31.12.59		SURPLUS AND LIABILITIES	£	£
£	£			
		Accumulated Fund		
		Balance 1st January 1960	39,049	
		Less— Deficit on Revenue Account	4,148	
			34,901	
		Less— Additional provision for Journal Income received in advance of publication	3,400	
39,049				31,501
		Development Fund		
		Balance 1st January 1960	1,372	
		Add— Surplus from Colour Index (2nd Edition) Account	3,473	
1,372				4,845
1,851		**Foundation Fund**	1,851	
100		**Knecht Memorial Fund**	100	
		George Douglas		
2,000		**Lecture Fund**	2,000	
		George Douglas		
341	4,292	**Accumulated Income**	299	4,250
4,331		**Sundry Creditors and Amounts Received in Advance**		9,366
		A.A.T.C.C.		
1,102		Amounts owing (but not currently payable) in connection with the Colour Index and Supplement		1,802
£50,136				£51,764

A. WADDINGTON *Honorary Treasurer*

L. MORTON WOOD *Honorary Secretary*

31.12.59		ASSETS	Approx. Middle Market Value 31.12.60	At Cost
£	£		£	£
		Accumulated Fund		
21,895		**Investments**	18,064	22,749
		Foundation Fund		
1,851		**Investments**	1,868	1,851
		Knecht Memorial Fund		
100		**Investments**	61	100
		George Douglas Lecture		
2,000		**Fund Investments**	1,187	2,000
25,846			£21,180	26,700
	623	**Coat of Arms**		623
	324	**Cash in Hand**	253	
	2,166	**Cash at Bank**	1,750	
		Debtors and Payments in		
6,769		**Advance**	6,137	
8,006	17,265	**Stocks**	7,151	15,291
		Furniture and Equipment		
		Library and Committee		
162		Room	242	
2,955	3,147	General Office	3,182	3,424
—		**Alterations to Premises**		426
		Library (At Nominal		
100		**Valuation)**		100
		I.F.A.T.C.C. London Congress 1959		
1,638		Advances by Society		—
		Supplement to Colour Index in conjunction with A.A.T.C.C		
1,517		Excess of Expenditure over Income to date		5,200
£50,136				£51,764

AUDITORS' REPORT

We have examined the above Balance Sheet with the Books and Documents of the Society produced to us. In our opinion the above Balance Sheet is properly drawn up so as to exhibit a true and fair view of the state of the Society's affairs according to the best of our information and the explanations given to us and as shown by the Books of the Society.

RAWLINSON, GREAVES & MITCHELL
Chartered Accountants
Auditors

Bradford
1 March 1961

Consolidated General Revenue Account

for the Year ended 31 December 1960

31.12.59	EXPENDITURE	£	£
9,568	Salaries, Wages, National Insurance and Honoraria	10,905	
799	Rent, Rates and Insurance	855	
182	Electricity and Heating	192	
584	Telephone	580	
1,249	Printing and Stationery	1,488	
612	Postages	597	
388	Hire of Rooms for Meetings, etc.	474	
883	General Travelling and Hotel Charges	770	
206	Incidental Office Costs	342	
350	Depreciation of Office Furniture and Equipment	380	
—	Amount Written Off Alterations to Premises	214	
61	Bank Charges	87	
259	Audit and Accountancy	374	
92	Repairs and Renewals	321	
233	Medals and Diploma Costs	237	
1,527	Sectional Costs	1,269	
13,860	Printing and Publishing Journal and other Publications	17,351	
154	Annual Meeting and Dinner	56	
125	International Federation— Subscription and Expenses	468	
596	Abstractors' Fees and Book Reviews	589	
—	Professional Fees for Rating Appeal	147	
31,719		37,696	
2,360	*Less*— Expenditure incurred above and allocated to Colour Index (£875) and Supplement (£2,240)	3,115	
	Expenditure of 1959 now allocated to Supplement	1,100	4,215
£29,359			£33,481

Note— International Federation

Expenses have been incurred by the Society in providing administration assistance to the Federation whilst under British Presidency.

31.12.59	INCOME	£
8,245	Membership Subscriptions	8,436
	Journal	
16,236	Income from Journals, Reprints, Combined Reports, Advertisements, etc., as adjusted for Opening and Closing Stocks	17,444
799	Investment Income (Gross)	714
4	Interest on Bank Deposit Account	7
2,203	Balance on account "Fastness Tests"	2,464
150	Donations	150
—	Summer School Surplus	118
353	Accrued Interest on Realisation of National Savings Certificates	—
1,459	Deficit— Transferred to Accumulated Fund	4,148
£29,359		£33,481

COLOUR INDEX (2nd EDITION) ACCOUNT

as at 31 December 1960

	£		£
Stock at 1st January 1960	4,184	Income	6,029
Cost of Packing and Shipping of Volumes to U.S.A	514	Stock of Colour Index at 31st December 1960	
Other Expenditure	1,398	(At Value agreed with A.A.T.C.C.)	3,540
Balance, transferred to Development Fund	3,473		
	£9,569		£9,569

GEORGE DOUGLAS ACCUMULATION FUND ACCOUNT

31.12.59		£	31.12.59		£
6	Lecture Expenses	101		Balance per Accumulated Income Account 1.1.60	341
341	Balance per Accumulated Income Account 31.12.60	299	231		
			56	Lecture Expenses Refunded	—
				Investment Income	
			60	3% British Transport Stock 1978/88	59
£347		£400	£347		£400

GEORGE DOUGLAS LECTURE FUND

	Balance 1959	*Alterations*	*Balance 1960*	*Middle Market Value 1959*	*Middle Market Value 1960*	*Middle Market Quotation*
3% British Transport Stock 1978/88	*£2,000*		£2,000	*£1,334*	£1,187	59⅜

KNECHT MEMORIAL FUND

3% Southern Rhodesia Stock 1971/73	*£100*		£100	*£71*	£81	61¼

SCHEDULE OF FOUNDATION FUND ACCOUNT INVESTMENTS

	£		£	£	£	
National Savings Certificates						
Proceeds of Realisation not yet re-invested	*500*	Re-invested in Corporation Mortgage	—	*500*	—	—
Bradford Corporation 5¼% Mortgage 1965	—	Purchased during year	500	—	500	PAR
3% Savings Bonds 1960/70	*70*		70	*57*	54	78¼
Treasury 3½% Stock 1979/81	*36*		36	*29*	27	71⅜
3% British Electricity Guaranteed Stock 1968/73	*1,245*		1,245	*1,376*	1,287	74
	£1,851		£1,851	*£1,962*	£1,868	

SCHEDULE OF ACCUMULATED FUND INVESTMENTS

	£		£	£	£	
3% British Transport Guaranteed Stock 1978/88	*2,599*		2,599	*1,858*	1,653	59⅛
2½% Funding Stock 1956/61	*750*		750	*739*	746	99½
3½% Conversion Loan 1961 or after	*557*		557	*357*	322	59
3% Savings Bonds 1960/70	*2,750*		2,750	*2,277*	2,160	78¼
3% Funding Stock 1966/68	*750*		750	*636*	610	81¼ XD
3% British Gas Stock 1990/95	*2,000*		2,000	*1,344*	1,180	59
3% Treasury Stock 1966 or after	*1,957*		1,957	*1,145*	1,024	50½
3% Southern Rhodesia Stock 1971/73	*910*		911	*649*	554	61¼
York County Savings Bank	*4,718*	Interest credited during the year £100 Defence Bonds Interest credited during the year £7 £2,584 re-invested in Corporation Mortgages (*See below*)	2,241	*4,718*	2,241	—
Post Office Savings Bank	*1,187*	Interest credited during the year £12. Account closed during year and £1,199 re-invested in Corporation Mortgages (*See below*)	—	*1,187*	—	—
3% British Electricity Guaranteed Stock 1968/73	*1,496*		1,496	*1,187*	1,110	74
Treasury 3½% Stock 1979/81	*1,007*		1,007	*819*	744	71⅜
3½% Defence Bonds	*220*		220	*220*	220	PAR
Chesterfield Corporation 3% Stock 1960	*994*		—	*996*	—	—
Chesterfield Corporation 5½% Mortgage 1965	—	Conversion of Chesterfield Corporation 3% Stock 1960	999	—	1,000	PAR
Manchester Corporation 5½% Mortgage 1965	—	Purchased during year	2,506	—	2,500	PAR
Bradford Corporation 5½% Mortgage 1965	—	Purchased during year	2,006	—	2,000	PAR
	£21,895		£22,749	*£18,126*	£18,064	

there had been a concentrated effort since the last Annual General Meeting.

With regard to the Balance Sheet, there was a deduction of £3,400 from the Accumulated Fund. This sum represented payment in advance of *Journal* subscriptions, in past years, when the practice had been to bring into the accounts subscriptions received during that year, but the Auditors had now contended that this did not concern the 1960 accounts and therefore pre-payment for *Journal* contracts had been withdrawn from the Accumulated Fund. The Finance and General Purposes Committee had decided that, as far as possible, new *Journal* contracts would be drawn up to expire at December 31st in each year. A number of existing contracts had been amended to coincide with the the financial year, and it was hoped that shortly after next year all contracts would do so.

The Development Fund item related to the surplus from the Second Edition of the *Colour Index*. There were 900 sets still in stock and it was hoped that the new Supplement would influence the disposal of these remaining volumes.

The 3% Chesterfield Corporation Stock had been renewed at 5½%.

The item "Alterations to Premises" concerned premises not belonging to the Society, but these alterations were not of a permanent structural nature. It had been decided to write off the cost in three instalments. The main items had been alterations to the Editor's office, and to the library to enable committee meetings to be held there. The latter should produce a considerable saving in the cost of hiring rooms.

The last item of £5,200 on the Assets side of the Balance Sheet was the net payment by the Society and the American Association of Textile Chemists and Colorists towards the cost of production of the *Colour Index* Supplement, which it was expected would be published during 1962.

The item "Professional Fees for Rating Appeal" appearing in the Revenue Account had been in connection with an appeal by the Society as a scientific and charitable body against ratable assessment, but in view of the Pritchard Report and on legal advice it had been decided not to proceed.

In conclusion, Mr. Waddington regretted the depressing financial result of a very active year in the affairs of the Society and wished it to be borne in mind that rising costs, not having been covered over the past two years, had caused the deficit, but he considered that future accounts would be satisfactory. He formally moved the adoption of the Accounts and Balance Sheet.

Seconding the proposition, Mr. G. S. J. White, Chairman of the Finance and General Purposes Committee, paid tribute to the effort and work of the Honorary Treasurer and colleagues on the Committee. This Committee had taken careful notice of views expressed at the last Annual General Meeting, and had investigated in minute detail Head Office, *Journal*, and Sectional expenditure. In addition, steps had been taken to increase the Society's income.

The President invited questions.

Mr. J. Barritt, Chairman of the *Colour Index* Editorial Board, reporting on the progress made with the Supplement, had every hope that it would be published in 1962.

Mr. H. Foster drew attention to there being no mention in the Minutes of the last Annual General Meeting of the Honorary Treasurer's forecast of the deficit on the Accounts. He commented on the increased wages and salaries, and considered that the income from subscriptions did not accurately compare with the increased membership. He urged that any extravagance be avoided in postages, travelling, and the use of hotels, and also advocated that the cost of the Coat of Arms should disappear from the Balance Sheet.

The Honorary Treasurer, explaining the increase in salaries and wages, said these were in accordance with the trend for remuneration to rise, and changes in staff had also influenced the position. The staff travelled second-class and stayed in hotels approved by him. He was in agreement about the Coat of Arms, but with regard to the increase in members not being reflected in the subscriptions received, this was due to an influx of Junior Members at the reduced membership subscription rate.

With regard to the International Federation of Associations of Textile Chemists and Colourists, the Honorary Treasurer reported that a substantial increase in the amount of the subscription payable had occurred, on a *per capita* basis.

Mr. J. W. Reidy considered it was an expensive practice to send out franked envelopes for the return of voting papers. The President explained this was an experiment in an effort to stimulate the return of more voting papers, and the response had been substantially greater than before.

Mr. K. McLaren, Chairman of the Fastness Tests Co-ordinating Committee, drew attention to meetings having been held in hotels when premises of kindred bodies were available. The President felt this to be undesirable unless there were special circumstances in favour of the use of a hotel.

It was resolved that the accounts for the year ended 31st December 1960 be adopted.

5. REDUCED SUBSCRIPTIONS FOR RETIRED MEMBERS

The President submitted a recommendation of the Council of the Society as follows —

> That Members who have paid subscriptions for twenty years and who retire at the age of 60 years or over may (*a*) apply to the Society for the reduced rate of one quarter of the annual subscription, in which case the letters A.S.D.C. or F.S.D.C. may be used and Section notices will be sent, or (*b*) apply for full membership at three-quarters of the ordinary subscription in which case the letters A.S.D.C. or F.S.D.C. may be used and the *Journal* and Section notices will be included.

Mr. J. Barritt said that this matter had come to the notice of the Council, and although the Society wanted all the money it could get, it was considered that here was a case where it would be reasonable to make some reduction in the annual subscriptions so far as possible. The numbers would be small but the relief worthwhile to those concerned.

Seconding, Mr. A. THOMSON, Chairman of the Publications Committee, said it would be of great benefit to certain members and would not harm the Society.

Miss E. SMITH, Honorary Secretary of the West Riding Section and of the Fastness Tests Co-ordinating Committee, suggested that the position needed clarifying by inserting "where applicable" after the letters A.S.D.C. or F.S.D.C. An amendment was accepted from Dr. P. W. CUNLIFFE that the words "not less than" be inserted before "twenty years".

An assurance was given that there would be special consideration granted to those members who, having retired and left the Society, might wish to renew their membership under the new conditions of a reduced subscription in retirement.

Mr. G. S. J. WHITE suggested that, as it was not known how many would wish to take advantage of the reductions, the matter should be publicised in the *Journal*. Mr. J. BARRITT advocated that the meeting approve the sense of the proposition and that the details be worked out later by the Council.

The President having assured the meeting that Council would endeavour to implement the suggestions made, the motion was carried unanimously

Mr. J. A. WALLWORK thanked those who had helped to bring about the resolution. It would help him and many others who had been members for twenty years or more.

6. HONORARY FELLOWS

The President submitted a recommendation of the Council of the Society that the following be included in By-law No. 2—

That Council is authorised to elect Honorary Fellows.

Mr. C. PAINE, Chairman of the Diplomas Committee and a Past President, proposing, said that the Council had asked the Diplomas Committee to consider the structure of the Society's awards, in particular whether there was a case for instituting Honorary Fellowship. The Society had in the past, in a limited number of instances, elected Honorary Members. By tradition, it had been a privilege vested in Presidents as an award to a member for distinguished work in the highest councils over a substantial period. The problem was that the Society might wish from time to time to honour distinguished people outside its own membership who might lack any specific tinctorial or scientific knowledge in a sense which would fall within the regulations normally used for an award of Fellowship. Such distinguished persons would normally have to be those whose work and influence were outstanding, e.g. professional men in industry, scientists, technologists, or educationalists. Work in the fields of tinctorial science or technology, where it could be seen to be of value to the objects which the Society sought to achieve, would be an additional reason for some kind of recommendation by the Society. Here, perhaps, was scope for an award of Honorary Fellowship, as distinct from Honorary Membership.

The Diplomas Committee had embodied their discussions and findings in the following recommendation to the Council—

> That the Society should institute an Honorary Fellowship. This award to be reserved primarily, but not necessarily exclusively, for honouring non-members of the Society who have achieved outstanding distinction in industry, technology, science, general scholarship or education, in a similar manner to the way in which a university confers honorary degrees. The possession of an honorary LL.D. does not mean that the recipient knows anything about the law. Nominations for such awards could properly be recommended to the Council by the Diplomas Committee. The recommendation by the Diplomas Committee should take the form of a full and detailed citation of the nominee's distinctions and achievements. It would be understood that the President and/or Council could, at any time, request the Diplomas Committee to examine particular individual cases and to make appropriate recommendations.

That recommendation had been fully discussed by the Council, which, on 2nd November 1960, had resolved to recommend to the Annual General Meeting the acceptance of this rider.

Seconding, Mr. H. A. TURNER, a former Vice-president of the Society, was of the opinion that this would give the Society the means of honouring those who should be honoured as helping, directly or indirectly, the Society's interests and objects. He felt that all cases would be discussed in great detail and such awards should not be numerous.

There was a suggestion to limit the number of Honorary Fellowships, which Mr. Paine felt was undesirable; he added that after careful consideration it had been thought to be an unwise policy to attempt to quantify the awards. Clearly it was intended to be a relatively rare distinction.

The motion was carried unanimously.

7. ELECTION OF PRESIDENT FOR THE FORTHCOMING YEAR

The President expressed great pleasure in proposing that the President-elect, Mr. Ramsay J. Hannay, a former Vice-president of the Society, be President for the ensuing year. Mr. Hannay was known as a very stalwart supporter of the Society and had been on the Council for many years. He had played in important part in its deliberations, and he was a widely travelled man, both in business and on the Society's behalf.

Seconding, Dr. H. W. ELLIS, a Past Chairman of the London Section, paid tribute to Mr. Hannay, whom they all not only knew very well but also liked very much. Mr. Hannay was a man of wide experience who would take his place amongst his illustrious predecessors.

The proposition was put and carried unanimously and with acclamation.

Mr. Hannay was invested with the chain of office and presided over the subsequent proceedings.

The President, Mr. RAMSAY J. HANNAY, thanked members for the honour conferred upon him. He had been a member of the Society since 1924, although he knew a good deal about it from as far back as 1916. It was an honour which he accepted in the spirit in which it had been conferred, not because of any particular merit he possessed but because in the work of the Society he had found complete enjoyment. It was a good thing that the atmosphere of the Society was such that they could argue in good spirit without hard feeling and sort out its affairs in the best interests of all

concerned. He would do his best, during his period of office, to maintain the standard and repute of the Society wherever it came into contact with kindred societies or with the public in general.

8. ELECTION OF PRESIDENT-ELECT

The President said that, as his first duty, he had very great pleasure in putting forward the name of Mr. Richard Charles Oakley, a Vice-president of the Society, to be President-elect. Mr. Oakley was a member of the London Section, a long-standing member of the Society, and a very responsible one, who had done excellent work. He had had charge of the work on the social side of the 1959 International Congress and, together with his committee, had made a very good job of it. In proposing the name of Mr. Oakley the Society was honouring not only him, but also the southern Sections.

Seconding, Mr. JOHN BOULTON, a Past President of the Society, recalled that he had first come into contact with Mr. Oakley during the long preparations for the London Congress, and had found him to be a kind, friendly and efficient person, whose qualities were obviously of presidential calibre.

The proposition was put and carried unanimously.

The President-elect, Mr. R. C. OAKLEY, having congratulated the President upon his election to the presidency and thanked Mr. Stevenson, the Immediate Past President, for his friendliness and leadership, declared that his own election filled him with great pride and gratitude. He valued this, the highest office ever likely to be bestowed upon him, and would do his utmost to serve the Society to the best of his ability.

9. VOTE OF THANKS TO RETIRING PRESIDENT

The President, in thanking the retiring President, endorsed all that Mr. Oakley had said. It had been a delight to serve under Mr. Stevenson, whom he thanked for the very able and magnificent way in which he had conducted the Society's business. It gave him very great pleasure to present to Mr. Stevenson the Past President's Badge.

Mr. F. M. STEVENSON, expressing the great pleasure it had been to him to serve the Society as President, said this high honour had brought a rich personal reward to him in the widening of the many friendly contacts he had made throughout all Sections of the Society. He was happy to tell the meeting that on Thursday of that week the papers had been completed for presentation of the Charter and were in the office of the Clerk to the Privy Council. He thanked the President for the lovely jewel which he would treasure and wear with great pride.

10. ELECTION OF ONE VICE-PRESIDENT

The General Secretary gave the result of the ballot for one Vice-president, which was as follows—

Mr. C. O. Clark	679 votes
Dr. H. W. Ellis	421 votes
Mr. H. Boothroyd	286 votes

There was also one spoilt ballot paper.

The President said that he had much pleasure in declaring Mr. C. O. Clark elected a Vice-president.

11. ELECTION OF FOUR ORDINARY MEMBERS OF COUNCIL

The General Secretary reported that 1402 ballot papers had been received, of which one was spoilt. The number of votes recorded for each candidate were as follows—

Dr. J. F. Gaunt	925 votes
Mr. K. McLaren	845 votes
Dr. L. Peters	770 votes
Mr. H. R. Hadfield	710 votes
Mr. J. Rankin	593 votes
Mr. W. L. Langton	471 votes
Mr. R. Woods	437 votes
Mr. F. V. Davis	435 votes

The counting of the votes was carried out by the Auditors to the Society, supervised by Mr. C. Luxton, Chartered Accountant.

The President declared the following elections to Council—

Dr. J. F. Gaunt
Mr. K. McLaren
Dr. L. Peters
Mr. H. R. Hadfield

and extended a welcome to the new members.

12. VOTE OF THANKS TO RETIRING VICE-PRESIDENT AND ORDINARY MEMBERS OF COUNCIL

Mr. R. K. FOURNESS, a Member of Council, proposed a vote of thanks to the retiring Vice-president, Mr. R. J. Hannay, and four Members of Council—Mr. G. B. Angus, Mr. S. R. Cockett, Mr. H. Hampson, and Dr. A. E. Stubbs. In conveying these thanks he was pleased to note that two of the five gentlemen, because of their election to other offices, would not be leaving Council. Mr. A. S. CLULEY, Immediate Past Chairman of the Midlands Section, seconded the motion, which was carried with acclamation.

13. ELECTION OF HONORARY TREASURER AND HONORARY SECRETARY

The President, in proposing the re-election of Mr. A. Waddington as Honorary Treasurer and Mr. L. M. Wood as Honorary Secretary, thanked both warmly for the services they had rendered during the past year. Mr. F. M. STEVENSON seconded the proposal.

There were no other nominations and the proposal was carried unanimously.

14. APPOINTMENT OF AUDITORS

Mr. C. O. CLARK, a Vice-president of the Society, proposed, and Mr. J. C. WRIGHT, Chairman of the Midlands Section, seconded, and it was carried unanimously, that Messrs. Rawlinson, Greaves & Mitchell, Chartered Accountants, be re-appointed Auditors to the Society.

15. VOTE OF THANKS TO PRESIDING OFFICERS

On the proposal of Mr. W. PENN, a Vice-president of the Society, a vote of thanks to the Immediate Past President and the newly elected President for their efficient conduct of the meeting was recorded.

The meeting was declared closed.

Annual Dinner

The Seventy-seventh Annual Dinner of the Society was held at the Midland Hotel, Manchester, on Friday evening, 28th April 1961, under the presidency of Mr. R. J. Hannay.

The principal guest was Mr. Denzil Freeth, M.P. (*Parliamentary Secretary to the Minister for Science*). Other guests were Professor Sir Alexander R. Todd (*Professor of Organic Chemistry, University of Cambridge; President of the Chemical Society*), Mr. A. C. M. Harding (*Prime Warden of the Worshipful Company of Dyers*), Mr. F. M. Stevenson (*Immediate Past President of the Society*), Mr. J. Boulton (*President of the International Federation of Associations of Textile Chemists and Colourists* and a *Past President of the Society*), Dr. W. Kunz (*President of the Schweizerische Verein der Chemiker-Coloristen*), Mr. C. Zuber (*President of the Association des Chimistes de l'Industrie Textile*), Dr. C. Whitworth (*Principal of Salford Royal Technical College*), Professor R. H. Peters (*Professor of Textile Chemistry at the Manchester College of Science and Technology*), Professor J. B. Speakman (*Professor of Textile Industries at the University of Leeds*), Councillor M. P. Pariser (*President of the Manchester Federation of Scientific Societies*), Mr. G. R. Taylor (*Director of the Textile Finishing Trades Association*), Dr. A. R. Urquhart (*Chairman of Council of the Textile Institute*), Mr. G. D. Wade (*President of the Dyers and Finishers Association*), Mr. J. R. Bulmer (*representing the British Colour Council*), Mr. D. R. Balfour-Park (*Clerk to the Worshipful Company of Dyers*), Mr. R. H. Hamblin (*General Secretary of the Oil and Colour Chemists' Association*), Mr. D. B. Moore (*General Secretary of the Textile Institute*), Mr. J. R. Ruck-Keene (*General Secretary of the Chemical Society*), Mr. C. G. Hulse (*Board of Trade*), Dr. J. Avery, Mr. G. H. Carnall, Mr. R. D. Chorley, Mr. H. Clayton, Mr. W. F. Dunnett, Mr. J. Ewing, Mr. A. D. Ferns, Dr. J. W. Hannay, Mr. F. A. Helme, Mr. G. A. Spencer, Mr. R. C. Oakley (*President-elect of the Society* and *Vice-chairman of Council*), Mr. R. M. Buller (*of Bristows, Cooke & Carpmael, Solicitors to the Society*), Mr. L. E. Jones (*Honorary Patent Agent*), Mr. W. A. Edwards and Mr. W. Penn (*Gold Medallists*), Mr. H. H. Bowen, Mr. C. Paine, and Mr. F. Scholefield (*Honorary Members* and *Past Presidents*), Mr. J. Barritt (*Honorary Member*), Mr. H. A. Turner (*Immediate Past Chairman of the Manchester Section*), Mr. L. M. Wood (*Honorary Secretary*), and Mr. A. Waddington (*Honorary Treasurer*).

The following officers and other leading members of the Society also were present— Dr. T. Vickerstaff and Mr. G. S. J. White (*Vice-presidents*), Mr. A. W. Carpenter, Mr. R. K. Fourness, Mr. K. McLaren, Dr. L. Peters, Mr. J. W. Reidy (*Ordinary Members of Council*), Mr. F. Atack, Mr. S. R. Cockett, Mr. I. Gailey, Mr. G. Kendall, Mr. W. R. Leigh, Mr. J. N. Littler, Mr. J. Porter, Mr. J. Rayment, Mr. C. B. Roylance, Miss Esmée Smith, Mr. H. W. Taylor, Mr. H. Turner, Mr. J. C. Wright (*ex-officio Members of Council*), Mr. C. Broughton, Mr. W. Furness, Mr. J. A. Hawkes, Mr. W. R. Hermes, Jnr., Dr. A. P. Lockett, Mr. D. Thomas (*Junior Branch officers*), and Mr. J. S. Ward (*Chairman of Terms and Definitions Committee*).

The total number of diners was 606.

"THE SOCIETY OF DYERS AND COLOURISTS"

After the toast of "Her Majesty The Queen", that of "The Society of Dyers and Colourists" was proposed by—

Mr. DENZIL FREETH, M.P. (*Parliamentary Secretary to the Minister for Science*) who said it was a great pleasure for him to propose the toast and, at the same time, congratulate the President upon his new office.

It was a very great pleasure to be asked to salute a society whose main object was the advancement of science and technology in a particular field. Secondly, one must always applaud those who brought colour into daily life. It was really only since the Second World War that we in this country had discovered colour. One rejoiced to see colour being brought more and more into the home. In factory and office too, the stimulating— or, where desirable, soothing— effects of the judicious use of colour were being realised.

Clothes, too, were getting brighter. Of course, the female of the species had always gone in for colour. Unfortunately, since the Nineteenth Century, men's clothes had become less and less adventurous. To be garbed at such a function in black and white was unenterprising for a society of colourists. In the display of colour, in the Twentieth Century, males were far too timorous. It was only at the opening of Parliament, or at the Courts of Law, that something could be seen of the finery that used to be worn by the British male.

By 1984 the surplus of women would have disappeared, and 51% of the population would be male. Man would have to fight for his woman, and no doubt, as in the feathered world, the male would place high in his armoury the wearing of bright clothes. Unlike the birds, they could now choose the colours which they flaunted. They had come a long way since, over 100 years ago, Mr. William Perkin had discovered the dye Mauveine.

Their great industry had had its ups and downs, and all were determined that never again would the British dyestuffs industry be in the position it was at the outbreak of the First World War. Out of that war had come at least one good thing— the establishment of the Department of Scientific and Industrial Research, many of whose research associations were now doing scientific work complementary to that of the Society— research associations which provided a most effective means for enabling small firms to share the benefits of scientific research and development. They now covered about 60% of British manufacturing industry, and as roughly one-third of their income came from the taxpayer it was indeed surprising that the resources of the movement were not more widely used.

Research was a vitaliser which would keep industry healthy. It was not a drug to be used as a last resort. The country was dependent, in increasing its standard of living, upon the initiative and enterprise of industry selling more in export markets. Science, technological research, and development had very big parts to play, and research associations and societies such as the Society of Dyers and Colourists could do much to keep industry in touch with the main lines of progress.

A recent addition to the Research Association movement had been the establishment of a British industrial biological association to examine the possible effects on human health of food additives, including food colorants, and certain cosmetics. He hoped that more dyestuff manufacturers would become members of that new organisation, since it was essential that there should be co-operation between those who were interested in colour and those who were interested in health.

The Society had a deservedly international reputation. This was shown by the honoured position held by Mr. Boulton, who was the first British President of the International Federation, and also by the presence at the dinner of M. Zuber, of France, and Dr. Kunz, of Switzerland, and other friends from other European countries. To be an Associate or Fellow of the Society meant having attained a professional qualification which was held in high honour. The Society's membership was not large compared with that of some other societies, but it represented a very great achievement in a single industry. The development of standard methods of test, the wide circulation of the *Journal*, with its very high scientific standard, the lectures, symposia and summer schools which the Society held— all these were deserving of the highest tribute. The Society had realised how essential science was to modern industry. It had also realised that one could never rest on the laurels of past discoveries; each year produced fresh problems to be solved. It was in the knowledge the British dyestuffs industry was so vigorous a scientific body that he had faith in the continued prosperity of the industry.

Mr. Ramsay J. Hannay, B.Sc., F.R.I.C., F.T.I., F.S.D.C. (*President of the Society*), in responding to the toast, said that he was very conscious of the great honour bestowed upon him by the Society on his election to the office of President that day. It gave him particular pleasure that the distinction had been conferred at the meeting in Manchester, where so much of his early training had been undertaken and where his elder son had been trained at the same University, subsequently joining its staff.

The Society, however, had its origin on the other side of the Pennines but, like many a good man from the County Palatine, had travelled far since those early days. During that time (now 77 years) the Society had developed from a comparatively small parochial body into one of international repute with contacts and friends all over the world.

Although the Society had been in regular touch with kindred societies and individuals in many countries for many years, it was only within the last five years that they had taken any active part in any international association of kindred societies; and they had been honoured shortly after becoming affiliated to the I.F.A.T.C.C., when their own reigning president had been invited to become president of the International Federation. The closer link had proved to be a happy and fruitful one, and they looked forward to the future with the hope that the kindred societies in other countries would add to the interchange of knowledge at present taking place through that medium, thus enlarging the usefulness of the Federation in promoting the advance of the science and art of coloration.

Members of the Society should be proud of it. The founders had planned and built well. Because of their enthusiasm and devoted work, the Society had established itself firmly and had grown steadily in size and reputation. In its early days, facilities for post-school education and study had not easily been available to craftsmen and workers in industry, and the *Journal* and the meetings regularly held afforded new means of disseminating knowledge and exchanging ideas, which were eagerly grasped by those seeking to understand the new scientific approach to the problems of coloration. The quality of the papers appearing in the *Journal* and the calibre of the people willing to serve the Society and to lecture to its members had been well maintained, and the universities and technical colleges which had dyeing departments supported and acknowledged the contribution which the Society was making to the study and knowledge of colour by the approval shown to members of their staff who joined as members, by inviting members of the Society to lecture and demonstrate in their schools, and by consulting the Society when formulating special courses dealing with subjects in which they had a special interest. This had been continued throughout the years, culminating in the discussions within the last year or two with regard to adapting college courses to enable students to prepare more fully and more easily to meet the high standards of the Associateship examination.

Whether they acknowledged it or not, every member, as well as their industries, owed a debt to the Society for the contributions it had made to the development of new techniques, to the better understanding of the basic principles underlying long-established methods and processes leading to improvements therein, to the training and experience of the rising generation, and to the establishment of Britain as leader in the science and art of coloration. The success of the Society of Dyers and Colourists had been achieved largely by the hard work and cheerful service of its ordinary members. The local sections were its life-blood. Although the Society's Officers had responsible and important duties to perform, they had all started as ordinary members, serving on local or sectional committees, and learning something of the good fellowship which should and did exist in all its

sections. The Society could not function properly without a steady stream of younger members willing to accept responsibility and undertake voluntary jobs, which would make a demand on their time without offering any reward other than the satisfaction of knowing they were helping to carry on the good work started by their predecessors.

Another important factor in the success achieved was the support received from industries which members served, for which once again they expressed their thanks. One trusted that the work that the Society was doing in connection with education, with the establishment of standard methods of testing, with the publication of new developments and knowledge, would continue to merit that support in the future.

Finally, he would be neglecting his duty if he did not express to the permanent staff the thanks of the Society for their loyalty and hard work. As in other similar organisations, theirs was by no means an easy task, and the officers and members of various committees and working parties could not function properly without the vast attention to administrative detail that the staff gave.

The President said that it gave him very great pleasure to accede to the request which had been made by the Presidents of their continental sisters to offer their greetings.

* * *

M. ZUBER (*President of the Association des Chimistes de l'Industrie Textile*) said that he and his colleagues had been honoured by the Society's invitation to attend its annual dinner, which he accepted with pleasure, since it gave him the chance to bring the good wishes of his own association to the Society.

They were living at a time when the relationship between countries became more and more important every day. That was one of the reasons why the Society's affiliation to the International Federation and the active part played in its work and inception was so much appreciated.

M. Zuber paid tribute to the Society's Past President, Mr. Boulton, and expressed his Association's admiration for Mr. Boulton's hard work for the good of the Federation.

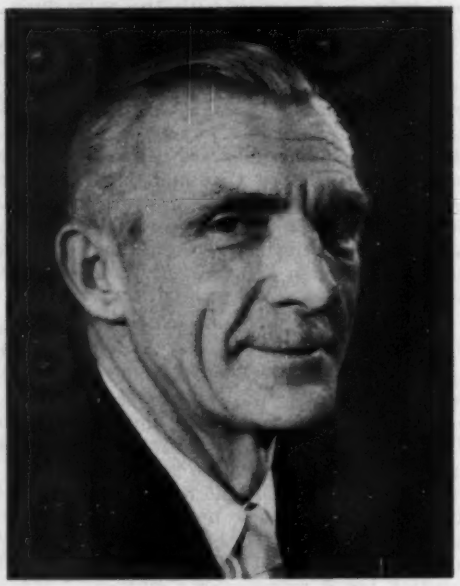
Dr. KUNZ (*President of the Schweizerischer Verein der Chemiker-Coloristen*) said that it was a great honour and extreme pleasure to present the very best regards and sincere wishes of the Society's "little sister".

He believed that the International Federation was a medium set for fruitful work, provided its activities and scope could be augmented further and further. A considerable amount of work was being done towards that cause at the present time, notably by the Society. The invitation to Presidents of other member societies of the Federation to take part in that day's events represented an important step forward to even closer unity within the Federation.

Dr. Kunz paid tribute to Mr. John Boulton, whose work within the Federation during the past three years had been greatly admired by the Swiss Society and by himself personally. He had shown the way towards a better understanding among the peoples of Europe, more particularly amongst the textile chemists and colourists of Europe.

HONORARY MEMBERSHIP

Mr. R. J. HANNAY (*President of the Society*) presented a Diploma of Honorary Membership of the Society to Mr. John Boulton, awarded "in



high appreciation of the outstanding part he has played in the affairs of the Society over a long period, particularly as its President (1958–60) and as the first British President of the International Federation of Associations of Textile Chemists and Colourists (1958–61)".

PRESENTATION OF AWARDS

It was announced that the Medals of the Society had been presented at a special ceremony held in Bradford on 1st March 1961. (An account of the ceremony appeared in the March issue of the *Journal*, pp. 114–115.)

"OUR GUESTS"

Mr. H. A. TURNER, M.Sc., F.R.I.C., F.T.I., F.S.D.C. (*Immediate Past Chairman of the Manchester Section*), in proposing the toast, said that his task was congenial, arduous and practically impossible. Congenial, because it was his duty to transmit that night to the Society's guests, eminent in themselves and representing so many activities in so many fields, the great welcome and good wishes of the Society, with its traditional hospitality and friendliness. Arduous, because, although he might be given a little to informal volubility, he had very little experience in public oratory. Almost impossible, because, according to his list, there were 45 guests (plus or minus one) and he had ten minutes (plus or minus five) in which to do it. Since he was faced with a very

long list of distinguished guests it seemed appropriate that a little judicious sampling and grouping should occur.

They had now had evidence of their wisdom in inviting Mr. Freeth, their chief guest. It was hoped that he would do combat with increasing ferocity for the recognition of the needs of science in the community. Mr. Freeth had already seen the activity of their branch of the scientific industry and could be assured that, when fighting his battles, there were many people who could provide him with extremely useful and pertinent ammunition.

On behalf of those present, he offered their very real congratulations to the President. They sincerely hoped that he would have the health and strength to carry out his most responsible and arduous task. It was another source of congratulation that Mr. Hannay's son, Dr. Hannay, who was already building up an enviable reputation as a biologist, should be present that night. They welcomed him and wished him all possible success in his future career.

Mr. Stevenson had already been thanked— not necessarily adequately, because there were few who really knew the extent of Mr. Stevenson's efforts on behalf of the Society during his year of office. But, again, they wished him the best of good fortune and passed on to him their most sincere gratitude.

He had intended to signalise their great interest in international affairs by expressing great pleasure at the presence of Mr. John Boulton, who might be honoured in many ways, but particularly in the international field, supported by Dr. Kunz and M. Zuber. There again, those gentlemen had spoken for themselves.

They welcomed the representatives of many kindred bodies whose objects, ambitions, and activities were comparable with their own. Perhaps as representative of that, they should take in order of antiquity and tradition the Worshipful Company of Dyers of the City of London. This body had supported the Society throughout its life with its own great resources and great traditions.

The dyemakers, chemical and fibre manufacturers, the great processing combines, and related trades associations, had honoured the Society by sending representatives, all of whom were eminent, and many of whom were old friends. He would like particularly to mention Mr. Travis, Secretary of the Dyers and Finishers Association of South Africa. To him and to his parent body they gave their best wishes.

Other bodies of various kinds were represented at the dinner, particularly educational institutions. There was one person whom he would like to mention particularly— Councillor Pariser. Councillor Pariser appeared as representative of the Manchester Federation of Scientific Societies. But he should be also honoured for his great personal contribution to higher scientific and technical education in that region, as the Chairman of the Council of the Manchester College of Science and Technology. He had put in enormous efforts towards the success and extraordinarily rapid growth of that institution.

Finally, the Society was very pleased to have Sir Alexander Todd among them, both as representative of the Chemical Society and as one of the most eminent chemists of their time, engaged as he was at the moment in fascinating studies which reached down to the origins of life itself.

Sir Alexander Todd, F.R.S. (*Professor of Organic Chemistry, University of Cambridge; President of the Chemical Society*) responding to the toast, said he would desire to say first of all, not only on his own behalf, but on behalf of the other guests, how greatly they had appreciated first the Society's invitation to be present, and, secondly— and perhaps more important— its hospitality and the good company they had had that evening.

It gave him particular pleasure to speak to the gathering that night, because although dyes and colour chemistry was not his normal line of country, he did have a very great admiration for the Society and the industries it represented— as all chemists should, because it had been the rise of the colour industry in this country and in Europe, about 100 years ago, that had triggered off the whole development of the modern chemical industry. It was his view that it had been the application of scientific research directly to the solution of industrial problems in the colour industry that had given a fillip to the chemical industries as a whole, and, by doing that, it had contributed enormously to the progress of chemical science. Everyone in chemistry ought to realise how much was owed in its development and success to the development of the dyestuffs industry and, associated with it, the dyeing industry.

The traditions of the colour industry and the dyestuffs industry were great ones, which had been upheld by the Society. He hoped the Society would continue to spread its leavening effect throughout the industry, because, if the country had a future, it was the chemical industry that was going to play a very large part in it. The Society's industry was in the heart of that, and so he wished it every success for the future, and said it from the heart.

Some Difficulties in the Coloration of Plastics

J. M. J. ESTEVEZ

Meeting of the Leeds Junior Branch held at the University of Leeds on 22nd November 1960, Mr. J. M. Wyles in the chair

Some of the problems which confront those engaged in colouring plastics raw materials are reviewed. Some problems have their origin in manufacturing methods and others in the use to which the final article will be put. They are described, and methods for solving them are discussed. The limitations of mechanical aids to the solution of colouring problems are indicated and information is given on the most commonly used colorants.

Introduction

Colour is of the utmost importance in the commerce and technology of plastics if only because many plastics articles are sold by virtue of the aesthetic appeal of their colour. It is, for example, the colour of the plastic washing-up bowl which accounts in large measure for the fact that it is superseding metal basins in the home. In fields such as advertising and packaging, a high degree of aesthetic appeal is essential, and emphasis must also be given to the house colours of the firms whose goods are advertised, whilst the dictates of designers must be followed with precision. In markets where the plastic material is of only ancillary importance—e.g. in manufacture of cars, telephones, lighting fittings—plastics are frequently chosen for their ability to contribute to aesthetic appeal. In some industrial markets, of which cable manufacture is a good example, the colour of the plastics serves duty as a code in assembly and service, and as such is an essential feature. Needless to say, in applications like signal lights colour is of supreme importance. In fact, colour is of no less importance in plastics than in textiles or paint—the range of coloured plastic articles is enormous.

In the terminology of plastics technology, a colorant which is insoluble in a polymer composition is referred to as a pigment, and one which is soluble as a dye. A solution of a dye in a plasticiser such as dibutyl phthalate could be referred to as "dyed dibutyl phthalate".

Problems of Coloration

Polymers are themselves generally water-white, translucent white or pale cream. Phenol–formaldehyde is the only outstanding exception, being reddish brown. Like the textile and paint industries, the plastics industry relies on synthetic dyes or pigments of inorganic or organic nature, natural or synthetic, for the actual colour. Colorants are added in the range 0·01–5% (generally about 1%) to give the desired colour, but stringent hurdles are imposed by plastics technology that are unknown to other industries using colorants, so that the range of available colorants is greatly restricted.

Resistance to the chemical environment of the polymer imposes the first hurdle. Plastics are polymerised under conditions which may include highly oxidising or highly reducing atmospheres, high or low pH, and nearly always high temperature. Sometimes it is essential to add the colorant before polymerisation, when one or more of these adverse circumstances will prevail. When possible the colorant is added after polymerisation, but even then there is always the possibility of small quantities of the polymerisation reactants being left with the polymer. This is especially true of catalyst residues, which can impair or even destroy the colorant. Where the colorant is added to the reactants before polymerisation, care in selection must be exercised to ensure that neither the colorant itself nor impurities associated with it interfere with polymerisation. Some of these can cause complete inhibition. A few cases are known, however, where the colorant, or something associated with it, can catalyse the polymerisation reaction so that it becomes uncontrollable.

Methods of Coloration

Various attempts have been made to colour plastic articles by techniques which can be classed together under the general heading dyeing, resulting in a dyeing of the surface of the plastic. Very few of these have been successful and with most plastics results are so poor that this subject is of little importance. The objections to known processes are that they give patchy results of poor stability, and only in exceptional cases give anything better than a light tint. The chief exceptions are the so-called casein plastic and nylon. The first, being a protein, can be dyed with comparative ease, with results which are fast and, where needed, intense in colour. Some success has also been recorded for the nylon group of plastics. Surgical sutures are generally satisfactorily coloured in this way.

Colorants are added to the polymers by Banbury mixing, ball milling, tumbler blending, hot rolling or extrusion. All are successful to differing degrees, but no one of them is entirely satisfactory. Many pigments, the cadmiums being an outstanding example, though highly satisfactory from all other points of view, deteriorate badly on grinding. With other pigments other difficulties may occur—some cake, some lose colour if the heating is excessive, and so on. When dealing with mixtures of pigments it is frequently found that the dispersing process acts differently on different pigments, according to their hardness, wetting angle and particle shape. In nearly all these procedures one comes across mysterious cases of segregation, only some of which are understood. It is felt that the colorant rather than the polymer is at fault. A great deal of investigational work remains to be done before one will be able to state with any certainty that such and such a process is

ideal for incorporating a particular pigment into a particular polymer.

Aggregation is for the plastics technologist, as for most users of pigments, one of the most troublesome properties of colorants. Apart from the fact that the final colour of a plastic composition of a particular formula depends upon the degree to which aggregates have been dispersed, aggregates have other and more seriously annoying features. In an electrical cable an aggregate of pigment will provide a conducting path which will ruin the insulating powers of the plastic. In a film or foil an aggregate will provide an area of weakness which will lead to thinning and the formation of pinholes or tears. Aggregates can perniciously break down at the very last moment. In mouldings they can lead to streaks by breaking down under the full pressure of moulding, just as the operation is ending. These streaks render the mouldings reject.

For transparent colours, soluble colorants are generally used (e.g. C.I. Solvent Red 4, C.I. Solvent Yellow 30, C.I. Solvent Green 3). Once they are in true solution these colorants are usually very much more simple to employ than pigments, but their use is limited, and getting them into solution is not always easy. They are of particular value when used in a liquid monomer, e.g. methyl methacrylate, and filtered prior to polymerisation.

DRY COLOURING

The process of dry colouring deserves special mention as, apart from colouring, it solves a major problem of the industry—the supply of plastics raw materials in a large number of colours each in small quantities. A moulder confronted with the need to keep a stock of one plastic of one set of properties in some twenty colours can purchase uncoloured polymer, and colour it as and when he wishes. For moulding grades of polymethyl methacrylate, a typical example, he would feed into a tumbler a quantity of polymer granule and selected colorants and tumble them, perhaps with the aid of porcelain balls, and sieve the mixture. This operation takes little time and hence solves a stocking problem and offers the moulder considerable freedom to offer coloured mouldings. For many articles this process is simple and trouble-free; but when precision in hue is needed, and when little batch-to-batch tolerance can be permitted, some technical skill in control is required to give satisfaction. Dry colouring cannot be adopted for all plastics, as not all plastics can be obtained with particles such that pigments can be dispersed by tumbling. Colouring by the fabricator of polymer–plasticiser mixtures is carried out in the industries based on some forms of polyvinyl chloride, i.e. the manufacture of leathercloth, polyvinyl chloride unsupported sheet, and some forms of hollow goods, e.g. dolls. The colouring methods used here are similar to those used in the paint industry.

Further Problems

Some pigments tend to segregate, and others (certain whites) to orient themselves during subsequent moulding or fabrication, even when properly dispersed in the plastics leaving the factory. The use of these pigments must be avoided because shaping or moulding the plastic into a useful article can cause the product to develop an unsightly appearance.

The plastics of commerce are generally offered for sale as sheets or granules. These have to be processed by fabrication, e.g. drawing or vacuum forming, or by moulding or extrusion. In all these processes the temperature is never less than 100°C, seldom less than 170°C and may reach 300°C. Thus temperature limits the available colorants; and with some of the processes needing high temperatures, e.g. the moulding of nylon 6.6, temperature considerations in the chemical environment of the particular plastic drastically restrict the list of suitable pigments, and hence the colour range in which the plastic can be offered.

Once the colour is put into the plastic it must stay there. Some colorants, e.g. monoazo pigments, tend to bloom to the surface, where a coloured dusty film can readily be rubbed off. Others may bleed from the plastic on to other materials in contact with it. Both these phenomena are closely associated, having their origin in the super-saturation of a constituent of the plastic by the colorant. At the surface the colorant is free as a solid deposit or is able to migrate as a coloured solution. Often colorants known to bleed or bloom can be used provided that a certain concentration limit is not exceeded.

Resistance to Weathering

Resistance to fading is of importance with all plastics and with some it can be the property of most interest to the user. Road lighting and road signs, railway station name-boards and advertising signs are expected to have a life of 10–15 years without serious deterioration of the plastic or appreciable fading of the pigments or dyes colouring it. Such a period of external exposure is some 3–4 times greater than that expected of paint, and very many times that expected of textiles, and hence imposes very severe criteria of selection of colorants. To a great extent the polymers protect the pigments, and frequently it is possible to employ colorants under conditions which, from the point of view of protection, are almost ideal. They then resist fading much better than they do alone or in other vehicles. But not all plastics afford the same degree of protection, polymethyl methacrylate being very much better than polyvinyl chloride. Nevertheless, only very few colorants will, even under the most favourable circumstances, withstand such periods of exposure. The coloured polymethyl methacrylate used in some signs is remarkable for weathering behaviour and can only be bettered by ceramics and glass. The specification of formulae for colouring plastics for such purposes is made more difficult by the need to provide, not so much a particular colour, as a particular shade, with precision.

Opals and white, which are of considerable importance in commerce, present difficulties of their own. The eye can detect very small differences in opacity and hence this must be rigorously controlled. White pigments have a tendency to

orient and hence on fabrication, e.g. on drawing a sheet after heating it, to exhibit an uncontrollable chalky effect. In the selection of pigments for such purposes attention must be paid to refractive index, particle size, particle shape, the distribution of particle size within the mass of pigment, light fastness, resistance to chemical attack and to temperature, and freedom from impurities which would cause deterioration of the polymer. This is a formidable list and necessitates not only very careful selection of the pigment, batch by batch, but also very careful control of the plastic in production.

Toxicity of Colorants

The toxicity of colorants must also be considered. Obviously, when dealing with plastics that are to be used for wrapping food, or in the manufacture of toys, a completely non-toxic formulation must be adhered to. However, this is only a minor difficulty for the manufacturer. Conditions of manufacture necessitate large-scale working and it is difficult to separate in production those batches to be sold for these purposes from those employed for purposes where toxic behaviour is of no importance. It is therefore essential to restrict as far as possible the use of toxic pigments throughout all production. Fortunately, the incorporation of a pigment into a thermoplastic material is attended by an encapsulating effect of the pigment. When, for example, a cadmium pigment is dispersed in polythene, although the pigment itself is soluble in acid, only minute quantities of cadmium can be extracted from the coloured polymer by mineral acid, and even less would be extracted under digestive conditions of animals. This gives a certain measure of safety, but care must still be used when all relevant factors are fully appreciated. Materials which are soluble in the plastic, and harmful impurities in the dye or pigment which are soluble when the colorant is not, are not encapsulated and therefore must be avoided or controlled. Plastics manufacturers can, however, offer for sale in a wide colour range plastic materials which are entirely harmless, whether used to contain or wrap food or even if eaten by a mischievous infant. Plastics manufacturers use huge quantities of dry colorants, so that considerations of toxicity must to some extent determine what is used in factories, even if the inclusion of a toxic material in the end-product would be no disadvantage.

Special Cases

Certain specialised uses of plastic articles impose special criteria. A very long list of examples could be given— the following are typical. In all plastics used for electrical work, tracking— the formation of a conducting path following arcing— is of importance. In plugs and sockets made from urea–formaldehyde resin, pigments may make a non-tracking plastic composition tracking to an unacceptable degree. This is especially so of Carbon Black (C.I. Pigment Black 6 and 7), favoured in this plastic for blacks. Pigments in certain electrical applications must be non-magnetic, opaque to radar rays, or opaque to X-rays. Plastics are used in surgical applications and if they are to be coloured the colorants must be physiologically inert. For example, coloured polymethyl methacrylate is employed as an artificial iris in eye surgery. Here the nature of the pigment is most critical. Not only must the pigments fulfil all the requirements connected with physiological inertness and the need for sterilisation, they must give opacity in thicknesses of less than 1 mm, and must have the right colour, and retain all these properties for ten years or more.

Colour Control and Matching

By far the biggest headache suffered by the plastics manufacturers in the field of colour results from the demand for batch-to-batch variations in colour which, if not undetectable, are negligible. In some cases demand is satisfied with some show of reluctance, though in others one is forced to sympathise with this demand. Sometimes, e.g. in the manufacture of telephones, production can be concentrated on one part for several months and then on another. The materials being used may have been produced with an interval exceeding 12 months between them. When the two parts are assembled, minute differences in colour are immediately apparent and the mouldings are unacceptable. Again, when plastics are used in applications where colour is an effective code or in signals, colour must conform to a specification with very narrow limits, and that over periods of many years. For advertising purposes and in bottle caps and containers in the cosmetic industry, it is insisted that the colours of the plastic articles match advertisements or conform to house rules. Under these circumstances only very small differences are permitted, and this sometimes makes the control of colour inordinately difficult. In general the ultimate consumer is little conscious of these differences, and considerably greater ones would not attract his attention; but it is not the ultimate consumer who decides the rules of the game. The rules are nevertheless there, and must be obeyed.

METAMERISM

Not all colorants can be used in all plastics, and as it frequently happens that one particular plastic has to match another under all conditions of lighting, severe difficulties in metamerism are frequently encountered. A very good example is the ruling of the Post Office that cable cords for the new telephones must match the telephones. The telephones are manufactured from polymethyl methacrylate and the cable cords from polyvinyl chloride, two plastic materials the colouring of which is about as different as it can be. In most cases these problems have been solved— as this one has— but not without a great deal of painstaking effort. Although it is possible to match the colour of most things in plastics, it is asking more than human ingenuity is capable of to expect all such matches to be perfect under all conditions of lighting. There are some astounding successes, but it requires a keen knowledge of the problems of colouring plastics to appreciate how astounding some of these are.

A good example is a particular lighting fitting where a urea–formaldehyde stand is required to match by daylight and by electric light a cellulose acetate shade. Perhaps the most difficult problem of all was posed by a vacuum carpet cleaner, where a match in all lights was required of polyvinyl chloride, polythene, cellulose acetate butyrate and paint, the paint setting the standard.

CONTROL AND INSTRUMENTATION

The general principle of colour control adopted by plastics manufacturers is to select two or more pigments so arranged in the colour solid that on addition they give the required colour, allow reasonable reproduction, do not require great precision in weighing, and permit of reasonable variations in the colour of the raw colorants. Only exceptionally is a single colorant used. Such techniques permit a high degree of control of colour without making particularly stringent demands on the suppliers of colorants. It is, however, necessary to ensure that supplies do conform to reasonable specifications as regards both colour and physical and chemical properties, e.g. particle size, freedom from impurities. In large-scale production the use of masterbatch techniques is invariably followed. The control of colour in production plants depends ultimately on the eye and human judgment. It is a simple matter to verify that there is no batch-to-batch variation when that is in fact so, but what is a good deal more difficult and a very great deal more important is to know exactly what tolerances can be permitted for particular applications, since the experienced eye seldom sees two batches as identical in colour. Instrumentation, and in particular the use of colorimeters, is being tried for this purpose, and though some successes have been recorded one cannot say that instrumentation is the complete answer to these difficult problems.

Even more exacting are the problems connected with colour matching, which are difficult enough when one has a range of pigments or dyes of suitable colour known to be acceptable in the polymers under consideration, which is not always so. There are those who are skilled at this work; they are rare and of great value, since they can hit on matches with little effort, whereas others only arrive at near misses with painstaking labour. Suggestions have been made for the use of computors coupled to instruments, e.g. spectrophotometers. There is no doubt that these proposals could achieve a certain degree of success, but experience suggests that at present the accuracy demanded by many customers for plastics is of an order of precision which poses problems which such machines can do little to solve.

Instrumentation in Weathering

Instrumentation is also much discussed in connection with accelerated weathering. Here one can speak with more certainty. No known instrument will do what is asked of it: fading, perhaps, but not weathering. Again, the uninteresting and unimportant aspects of the matter—the very easy cases which can almost be solved by inspection—have been ground for some success with instrumentation. But for the important problems, and in particular those where a period of the order of a decade is concerned—information frequently sought—instrumentation has nothing to offer. In fact, it can be dangerously misleading, placing in one order things which ordinary exposure places in another. This is a great misfortune, since nothing would aid plastics research more than to be able to predict with certainty in a matter of weeks how a plastic on exposure to the weather will behave in a matter of years. The problem is receiving attention, but it is only fair to state that no published results give any indication that the essentials of the difficulty are being met.

Colorants

The colorants which are most heavily relied upon are generally those that have been known over the years, to which have been added a few exceptional items of more recent introduction. The earth colours have many advantages and are used whenever they are relevant. Amongst inorganic pigments special praise must be given to the cadmium reds and yellows (e.g. C.I. Pigment Red 108, C.I. Pigment Yellow 37) and the ultramarines (e.g. C.I. Pigment Blue 29), which provide the most frequently used notes in our opera. Amongst white pigments, titanium dioxide is outstanding, though others are used occasionally. Only the rutile form of titanium dioxide behaves well—the anatase form gives very serious greying on exposure to weathering. For blacks, Carbon Black (C.I. Pigment Black 6 and 7) and nigrosine are the most frequently used and again others are used for special purposes. Amongst organic materials special mention should be made of the phthalocyanines (e.g. C.I. Pigment Blue 15 and C.I. Pigment Green 7) and the azo colorants. There are few colorants which have not at one time or another been brought into use, but it is surprising how frequently formulae are devised round well-trusted friends whose manners have been displayed over the years and whose good behaviour can be predicted with confidence.

Conclusion

Such then in outline are the problems and difficulties confronting those who seek to colour plastics. In the past decade or so great advances have been made, not only in the purely technical aspects of the colouring of plastics but in the wider matters concerned with the use of colour in plastics and the use of coloured plastic articles. One can be confident that as experience accumulates further progress will be made. The plastics industry takes pride in having made a very real contribution to the rise in the standard of living; the colourist has played his part in this and will make further contributions in the future.

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(*MS. received 14th February 1961*)

COMMUNICATION

The Interaction between some Acid Wool Dyes and Nonyl Phenol–Ethylene Oxide Derivatives

B. R. CRAVEN and A. DATYNER

Acid wool dyes show individual differences in behaviour towards non-ionic surfactants. Dyeing experiments and spectrophotometric measurements indicate that the degree of interaction between dyes and non-ionic surfactants of the nonyl phenol–ethylene oxide type increases with the hydrophobic nature of the dye.

Introduction

The use of surface-active agents (surfactants) in textile dyeing has become widespread in recent years, the most general claim made for their beneficial effects being that they assist in level dyeing. Various modes of action have been suggested for the achievement of level dyeing in different surfactant–dye–fibre systems[1–15], all relating to one or other of the properties peculiar to surfactants.

Since all surfactants are more or less effective as wetting agents, quick and effective wetting of fibres by a dyebath brings about intimate contact between dye solution and fibre surface. Such contact is also facilitated by the removal of residual fatty matter from fibre surfaces, for which the detergent properties of surfactants are useful. In addition it is known that some dyes are aggregated in solution[1,2,16,17] and it is likely that dye aggregates, when adsorbed as such by the fibre, will tend to migrate more slowly than single dye molecules or smaller aggregates, so that levelling proceeds more slowly. It has been suggested that the dispersing action of surfactants is likely to diminish aggregate size or even to disperse aggregates completely[18] and in this way assist in levelling. A further way in which surfactants act is by taking an indirect part in dyeing, either by competing with dye for the fibre or by combining with the dye[2].

The former type of action can take place between ionic dyes and similarly charged ionic surfactants, and advantage is taken of this when dyeing acrylic fibres with cationic dyes in presence of cationic surfactants. A similar mechanism has been proposed for the dyeing of polyamide fibres with anionic dyes in presence of anionic surfactants[19] to overcome difficulties normally associated with the dyeing of these fibres with acid dyes. Such methods can be used when dyeing takes place by combination of dye with specific sites in the fibre, but they are probably only feasible when the number of such sites is fairly small, as with acrylic and polyamide fibres (about 4 m equiv. of acidic sites per kg of Orlon and about 40 m equiv. of basic sites per kg of nylon 6.6). The number of basic sites in wool is considerably larger (800–900 m equiv. per kg) and, in any case, with dyes presenting special difficulties in levelling on wool, e.g. milling acid dyes, ionic forces between dye and fibre probably play only a subsidiary role to that of van der Waals forces.

Combination of dye with ionic surfactants can take place when the two are oppositely charged. The complex thus formed tends to flocculate, so that steps have to be taken to prevent its deposition on the fibre surface, by using either a non-ionic surfactant or excess of ionic surfactant to disperse the insoluble compound formed. Complex formation can also occur between ionic dyes and non-ionic surfactants, when flocculation does not take place. Several reasons have been put forward to explain the formation of this type of complex. Among them is the formation of a polyoxonium compound from the non-ionic surfactant in presence of positively charged ions; such a polyoxonium compound is weakly cationic and thus combines with anionic dyes[20]. It has been found that dyes are more soluble in aqueous solutions of surfactants than in water alone, the solubility in the surfactant solution increasing as the solubility in water decreases[21,22], and it has been suggested that the formation of mixed micelles containing dye and surfactant may be responsible for the increased solubility[21]. The existence of dye–surfactant micelles has also been proposed recently[12,23]; such micelles, it is suggested, contain one molecule of dye combined with a small number of surfactant molecules, and break down with increase in temperature, releasing free dye molecules or ions, which become available for combination with the fibre.

According to the experience of many dyers and the views of some authors[11,13], the behaviour of non-ionic surfactants with respect to level-dyeing acid dyes on wool is not easily predictable. When mixtures of wool dyes are used, it is not unknown for some components to be affected strongly by the addition of non-ionic surfactant, whereas others are unaffected. 2:1 Metal-complex dyes, however, appear to exhibit some uniformity in behaviour in presence of non-ionic surfactants. One reason for the difficulties experienced in predicting dyeing behaviour in presence of non-ionic surfactants is the dearth of information about systems containing both dye and surfactant. Complex formation has been suggested as being responsible for reduced dye uptake in presence of non-ionic surfactants, but apart from Luck's work, which was confined to an investigation of the complexes of Bromophenol Blue and non-ionic surfactants[12,23], little systematic information has been published about the nature of such complexes.

It has been noticed that colour changes occur on addition of certain non-ionic surfactants to aqueous solutions of some dyes, and investigations have been carried out with a view to utilising such surfactants in the absorptiometry of dyes not

otherwise amenable to treatment by Beer's Law [24]. Here it was thought that the non-ionic surfactant acts on the dye to cause complete disaggregation in a similar way to the action of organic solvents, e.g. alcohol or pyridine, when added to an aqueous solution of dye. Martin and Standing [24] commented on the difference in behaviour of Dispersol A (a condensation product of a fatty alcohol and ethylene oxide) and polyglycols, and suggested that the greater efficiency of the former in disaggregating dyes may be due to its ability to form micelles, a property not possessed by polyglycols. However, the function of non-ionic surfactants in this respect is not confined to disaggregation. Some dyes which are known to be disaggregated in aqueous solution still undergo colour changes with non-ionic surfactants [12, 23].

It seemed possible, therefore, that spectrophotometry might yield useful information on dye–non-ionic surfactant complexes. Accordingly, the aim of the present investigation was to determine whether the change in dyeing behaviour of a dye due to presence of non-ionic surfactant in the dyebath could be correlated with changes in the absorption spectrum of the dye under conditions similar to those used in dyeing. A number of acid dyes were selected for this work to cover a wide range of dyeing behaviour in presence of non-ionic surfactants.

Experimental

PURIFICATION OF MATERIALS

Dyes

Dyes used for this work were all obtained from the manufacturers as commercial products, and were purified by recrystallisation twice from aqueous ethyl alcohol, with the exception of Dye II, which was recrystallised from water. Both crude and purified dyes were paper chromatographed, using the horizontal paper method described by McNeil [25], and these experiments indicated that the recrystallised dyes were free from coloured impurities. The 2,7 disulphonic acid of Dye I was separated from the 2,6 isomer by column chromatography using a cellulose substrate. Structures and *Colour Index* numbers of the dyes are given in Table I.

Surfactants

The surfactants used in this investigation were obtained in crude form from the manufacturers' agents in Australia. They were purified by refluxing the surfactant (2 parts) with a mixture of water (4) and ethylene dichloride (1), separating the ethylene dichloride layer, and distilling off the solvent at reduced pressure [12, 26]. The compounds used had the structures—

$C_9H_{19}\cdot C_6H_5\cdot O\cdot C_2H_4\cdot(OC_2H_4)_9\cdot OH$ referred to as NP 10

$C_9H_{19}\cdot C_6H_5\cdot O\cdot C_2H_4\cdot(OC_2H_4)_{29}\cdot OH$ referred to as NP 30

The numbers of ethylene oxide units in these structures are the nominal means quoted by the manufacturers. The actual spread of the ethylene oxide chain lengths about these values is not known.

Fabric

A loosely woven fabric made from 64s Merino wool was used in this work.

DYEING EXPERIMENTS

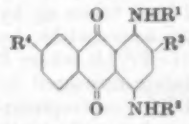
The dyeings were carried out in a neutral dyebath in absence of salt. Two reasons governed this choice—

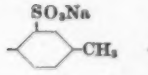
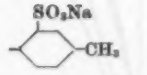
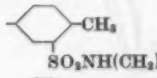
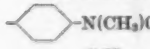
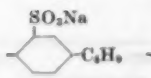
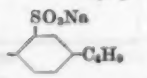
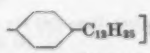
(1) The group of dyes selected for use in these experiments includes some which are usually applied to wool from a strongly acid dyebath, some from a weakly acid dyebath, and some from a

TABLE I

Structures and *Colour Index* Numbers of Dyes

Basic structure of dyes



Dye	Nature of substituents				*Colour Index* No.
	R^1	R^2	R^3	R^4	
I	H	H	SO_3Na	SO_3Na	C.I. Acid Blue 56
II			H	H	C.I. Acid Green 25
III	H		SO_3Na	H	—
IV	H		SO_3Na	H	C.I. Acid Blue 41
V	H	C_6H_5	SO_3Na	H	C.I. Acid Blue 25
VI			H	H	C.I. Acid Green 27
VII	H		SO_3Na	H	C.I. Acid Blue 138
VIII	H	$C_6H_4]SO_3Na$	$OC_{12}H_{25}$	H	C.I. Acid Violet 51

neutral one. Because dye uptake by wool changes with pH, it was felt that all dyeings should be carried out under the same conditions in order to permit comparison of results. It was therefore decided to carry out the dyeings in a dyebath which contained no acid, and so minimise the contribution of ionic forces to dye uptake. Ideally, the dyebath should have been buffered at a pH within the isoelectric region of wool, but this would have required the presence of relatively large concentrations of salt, and this was felt to be undesirable.

(2) Salt was excluded for the following reasons—

(*a*) It is possible that the addition of salt to solutions of acid dyes could cause changes in the state of aggregation of the dye molecules, the effect varying with different dyes.

(*b*) The uptake of some dyes by wool from a neutral dyebath is increased by the addition of salt [27] and again it seems very likely that the magnitude of this effect would vary from dye to dye.

The dyeing runs were all carried out in solutions which were 5×10^{-5} molar with respect to dye, using a liquor to wool ratio of 50:1. Five separate dyebaths, each of 50 ml, were prepared and heated to 45°C in a Marney-type laboratory dyeing machine. Five 1-g pieces of woollen fabric were wetted out by immersion in distilled water at 80°C for 5 min and allowed to drain in air for 1 min. One of these pieces was then introduced into each dyebath, and the temperature raised at 1·5 deg C per min. One piece of fabric was removed from the dyebath at each of the temperatures 55, 65, 75, 85 and 100°C, thoroughly rinsed in cold distilled water, centrifuged, and allowed to dry in air. This procedure was carried out with each of the dyes in turn, in solutions containing the following molar ratios of surfactant to dye: 0, 5, 10 and 15:1, for each surfactant.

The extent to which dye had been taken up by the fabric was estimated, where appropriate, by the Kubelka–Munk expression $(1-R)^2/2R$, where R is the reflectance of the dyed fabric measured by means of a Beckman Model DK2 spectrophotometer fitted with an integrating sphere reflectance attachment, using a piece of undyed fabric as standard [28]. It is well known that dye distribution on a wool fabric (i.e. degree of skittery dyeing) can affect the reflectance measurements, and it is also possible that the formation of agent–dye complexes of the type being studied will influence the distribution of absorbed dye on the wool fabric. This reasoning throws some doubt on the validity of reflectance measurements as a means of measuring dye absorption in this particular case. However, where marked changes in dye distribution were suspected the results were checked by absorption measurements on the exhausted dyebaths and no marked differences in dye absorption were found.

SPECTROPHOTOMETRIC MEASUREMENTS

Solutions which were 5×10^{-5} M with respect to dye were prepared containing the same amounts of non-ionic surfactant as were used in the dyeing experiments, and the absorption spectra in the visible region were measured at 25, 45, 63 and 85°C in a Beckman DK2 recording spectrophotometer fitted with a heated cell block. The temperature of this block was kept constant by a thermostatic device built to the design described by Marshall [29], modified slightly to allow the temperature of the block to reach 85°C.

The spectra for some of the dyes used are shown in Fig. 1–3, curves A to D. The spectra in presence of a very high excess of surfactant, viz. surfactant : dye ratios of 1000:1 and 2000:1, were also determined at room temperature, and are shown in Fig. 1–3, curves E and F.

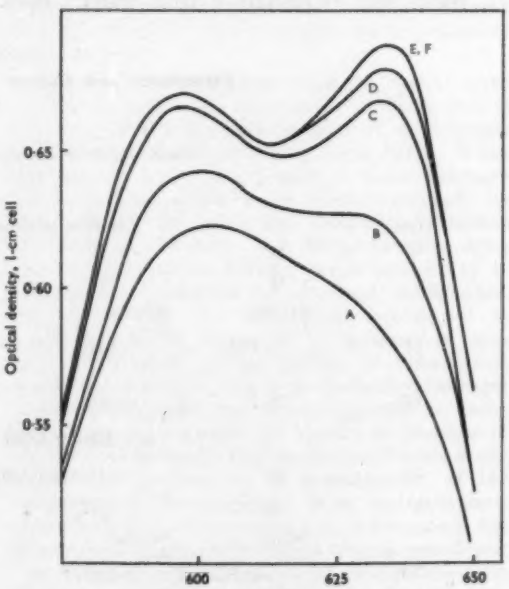
DETERMINATION OF DYE AGGREGATION

Mean diffusion coefficients of the dyes were measured in a cell of the type described by Northrop and Anson [30], using the procedure and method of calculation of Holmes and Standing [31]. The diffusion experiments were carried out in 0·014-M sodium sulphate solution to minimise the effects of charge separation due to differences in the rates of diffusion of cations and anions. The mean radius of the aggregates in solution was calculated from the Stokes–Einstein–Sutherland equation. From these data and an assumed particle density of 1·5 g/ml, the aggregation number, defined as the average number of dye molecules per dye aggregate, was calculated [1].

Results

DYEING EXPERIMENTS

When the values of $(1-R)^2/2R$ were plotted against temperature for the various surfactant : dye ratios for each of the dyes, it was found that



Surfactant : Dye— (A) No surfactant (B) 5:1 (C) 10:1 (D) 15:1 (E) 1000:1 (F) 2000:1

FIG. 1—Spectra of dye IV in presence of NP 30

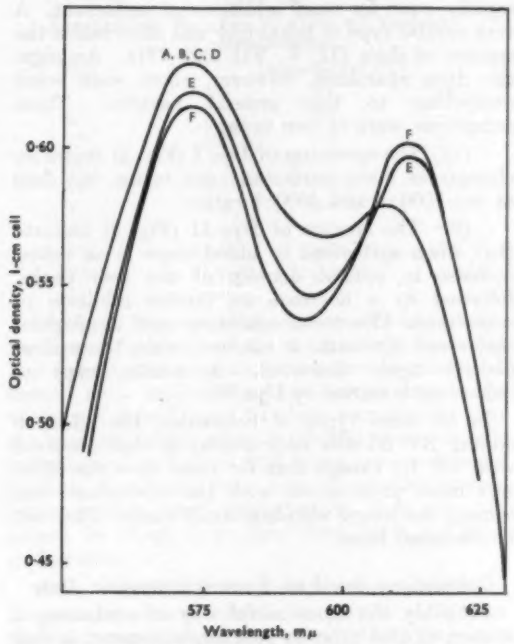


FIG. 2.— Spectra of dye I in presence of NP 30

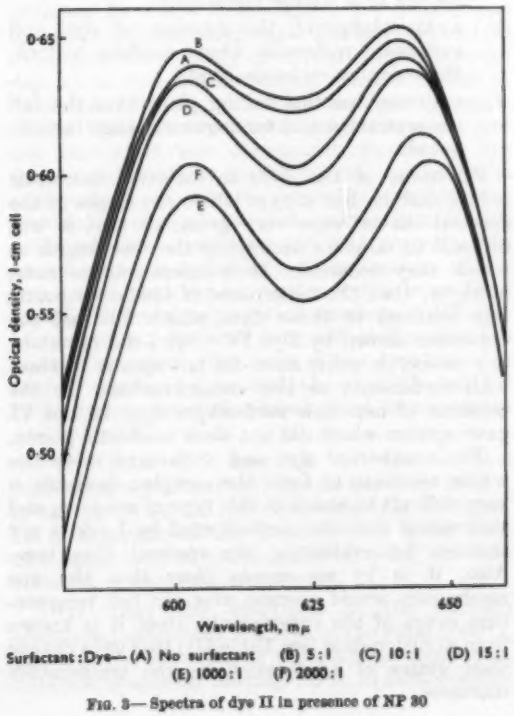


FIG. 3— Spectra of dye II in presence of NP 30

there were three classes of curve into one of which each dye–surfactant system could be placed. This classification is based on the difference between the $(1-R)^2/2R$ vs. temperature curve for the dye alone and that for the dye plus surfactant. Fig. 4 shows curves for hypothetical dye–surfactant mixtures and is intended to illustrate the three classes of behaviour observed. The characteristics of each of these classes are as follows—

Class A

(Curve A, Fig. 4) The curve representing the system dye plus surfactant is higher at all points than that of dye alone (Curve D), indicating that more dye is absorbed by the fibre in presence of surfactant. This could be due to the more complete wetting out of the wool fibre in presence of a

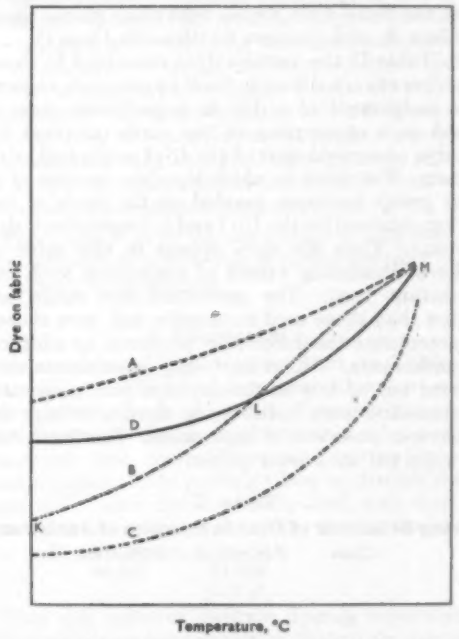


FIG. 4— Generalised dyeing behaviour in presence of NP 10 and NP 30

surfactant, leading to more rapid penetration by the dye molecules. It also indicates either no interaction between dye and surfactant or at most a very weak association.

Class C

(Curve C, Fig. 4) In this case addition of surfactant causes a considerable decrease in dye uptake by the fibre over the entire temperature range, the effect being less marked at higher temperatures. This behaviour is probably due to association of dye and surfactant molecules to form a complex which is apparently fairly stable to heat, so that even at temperatures near 100°C there is still sufficient dye in the complex to reduce the dye uptake.

Class B

(Curve B, Fig. 4) This does not represent a third separate type of behaviour of dye in presence

of surfactant, but rather is intermediate between the previous two. The part KL of the curve represents a system which belongs to Class C while the part LM represents the behaviour of a system of Class A. This means that at low temperatures the formation of a dye–surfactant complex is sufficiently pronounced to lower the uptake of dye by the fibre, but the complex is not stable to heat, and at temperatures above L the concentration of complex is so small as to be unable to reduce dye uptake. At higher temperatures, the surfactant appears to increase dye uptake for the reasons given under Class A above.

If the explanations given above for the various types of behaviour observed in dyeing are correct, it follows that the extent to which a dye associates with a nonyl phenol–ethylene oxide surfactant is least for those dyes whose behaviour places them in Class A, and greatest for those in Class C.

In Table II the various dyes examined in these experiments are shown in their appropriate classes. The assignment of a dye to a particular class is based on a comparison of the curve obtained for the dye alone with that of the 15:1 surfactant:dye system. The order in which the dyes are placed in each group has been decided on the basis of the curves obtained for the 10:1 and 5:1 surfactant:dye systems. Thus the dyes appear in this table in order of increasing extent of association with the surfactant used. The surfactant:dye ratios are higher than those used in practice and were chosen to accentuate the differences produced by addition of surfactants. Whilst no dyeing experiments were carried out at low surfactant:dye ratios, spectrophotometric work indicates no deviation from the behaviour observed at high ratios. This work will be reported in a later paper.

TABLE II

Dyeing Behaviour of Dyes in Presence of Surfactants

Class	Surfactant NP 10	Surfactant NP 30
A	I	
	IV	I
	V	
B	II	
	III	II
	VI	III
	VII	
C		IV
		V
	VIII	VI
		VII
		VIII

SPECTROPHOTOMETRIC MEASUREMENTS

The spectra of the majority of the dyes examined changed on addition of surfactant. For a given quantity of surfactant added, the change was smaller at higher surfactant:dye ratios. Fig. 1 shows the spectra obtained on adding NP 30 to dye IV; there is an enhancement of the original absorption peak of the dye at approximately 600 mμ, accompanied by a shift of this peak to shorter wavelengths, and at the same time a new peak at 634 mμ appears, which increases in optical density rapidly, even for small additions of surfactant. A very similar type of behaviour was observed in the spectra of dyes III, V, VII and VIII. Amongst the dyes examined, however, there were some exceptions to this general pattern. These exceptions were of two types—

(1) The spectrum of Dye I (Fig. 2) shows no changes at lower surfactant:dye ratios, but does at the 1000:1 and 2000:1 ratios.

(2) The spectra of Dye II (Fig. 3) indicate that when surfactant is added there is an initial increase in optical density of the two peaks, followed by a decrease on further addition of surfactant. This trend continues until the highest surfactant:dye ratio is reached, when the optical density again increases. A similar type of behaviour is shown by Dye VI.

In all three types of behaviour, the effect of adding NP 30 was very similar to that observed with NP 10, except that for some dyes the effect was more pronounced with the surfactant containing the longer ethylene oxide chain. This will be discussed later.

Calculations based on Spectrophotometric Data

Probably the most useful way of evaluating a system of this type by spectrophotometry is that used by Luck [12] whereby the equilibrium constant for the reaction between dye and non-ionic surfactant is obtained directly from the spectra, and from this ΔH, the heat of reaction, determined. This method depends on—

(*a*) the existence of an isosbestic point in the curves obtained for various additions of surfactant, indicating the existence of coloured species in a simple equilibrium,

(*b*) a knowledge of the number of dye and surfactant molecules which combine to form the complex molecule, and

(*c*) only one reaction taking place over the full concentration and temperature range investigated.

For some of the dyes investigated isosbestic points existed, but always where the slopes of the spectral curves were very great, so that it was difficult to measure accurately the wavelength at which they occurred. It is interesting to note, however, that the occurrence of isosbestic points was confined to those dyes which followed the behaviour shown by Dye IV. Dye I did not show any isosbestic point as it did not appear to react with surfactants at low concentrations. In the presence of non-ionic surfactants dyes II and VI gave spectra which did not show isosbestic points.

The number of dye and surfactant molecules which associate to form the complex molecule is very difficult to assess in this type of reaction, and this means that the method used by Luck is not suitable for evaluating the spectral data here. Also, it is by no means clear that the one mechanism would operate over the full temperature range of the experiments, since it is known from diffusion data (see Table III) that dyes change their states of aggregation as the temperature increases.

TABLE III

Aggregation Number of Dyes at Various Temperatures

Dye	Temperature (°C)		
	26	45	63
I	1·1	0·7	—
II	2·6	1·0	—
III	—	1·2	1·1
IV	2·5	1·2	1·3
V	18·2	0·8	0·8
VI	2·4	1·3	—
VII	18·2	5·3	2·8
VIII	v. high	v. high	v. high

Similarly, the non-ionic surfactant also changes its form in solution as the temperature increases, and indeed will separate from aqueous solution if heated to a sufficiently high temperature. The spectra of dyes II and VI show conclusively that the reaction taking place is not the same over the full range of surfactant : dye ratios used, so it is not possible to obtain from the spectrophotometric measurements any quantitative data on the extent to which these dyes react with non-ionic surfactants.

These considerations showed that insufficient information was available to permit a rigorous thermodynamic treatment, even to the dyes whose spectral behaviour resembled that of dye IV. However, we felt that the spectrophotometric data obtained should yield useful information for comparing the extent to which the various dyes react with non-ionic surfactants, provided that certain assumptions were made.

These assumptions are as follows—

(1) That at a given temperature, the spectrum obtained for a dye in solution is due to only one species of coloured compound. For most of the dyes examined, the validity of this assumption would depend on two considerations, viz. the extent of hydrolysis of the sodium salts of the dye sulphonate groups to form undissociated sulphonic acids, and the nature of any aggregated groups of dye molecules. The first reaction would probably be unimportant owing to the generally high degree of dissociation of sulphonic acids, particularly in such extremely dilute solutions, but with regard to the second point, it is unlikely, if aggregation of the dye occurs, that the aggregates would be uniform in size. However, aggregation numbers at different temperatures, calculated from diffusion coefficients of the dyes, show that most of the dyes are only slightly aggregated at and above 45°C, and for these dyes at least this assumption is reasonable (see Table III).

(2) That the spectrum of the solution containing surfactant and dye in the ratio 2000 : 1 is the spectrum of the dye–surfactant complex, i.e. at this ratio all the dye is present in the form of a single type of complex and no other similarly coloured compounds are present.

(3) That the spectrum of the solution containing surfactant and dye in the ratio 2000 : 1, taken as the spectrum of the complex compound, does not change on heating. It is, in fact, possible that this spectrum would alter slightly on heating owing to changes in the state of solvation of the complex molecule, but it is not possible to determine the extent of this change experimentally because at these high surfactant concentrations turbidity develops rapidly on heating. In addition, it would be very difficult to establish whether any changes observed were in fact due to changes in the complex spectrum or simply represented decomposition of the complex into dye and surfactant. At the surfactant : dye ratios used in the spectrophotometric work, solutions developing turbidity at high temperatures were not investigated at these temperatures.

On the basis of these assumptions it is possible to determine the molecular extinction coefficients of the free dye and a value which is a simple multiple of the molecular extinction coefficient of the dye–surfactant complex, the number of dye molecules in the complex molecule being unknown but assumed to be constant. From this information, the fraction of dye taking part in complex formation may be calculated. The increase in the solvent volume on heating does, of course, lower the optical density of solutions measured at higher temperatures, so that all optical densities and extinction coefficients were corrected to a standard temperature of 25°C.

Fig. 5 and 6 show the percentage of dye present as a complex as a function of surfactant : dye ratio at various temperatures.

Discussion

Comparison of the results given in Table II with Fig. 5 and 6 shows that there is some correlation between the effect of certain non-ionic surfactants on the dyeing behaviour of the dyes examined and their absorption spectra in the visible region. It is probably best to discuss these aspects for each dye separately first, and then to see whether any generalisations can be made for the dyes as a group.

DYE I

This dye behaves both in dyeing experiments and spectrophotometrically as though no complex forms with either of the surfactants up to a 15 : 1 surfactant : dye ratio.

DYE II

Unfortunately, this dye can be evaluated only with respect to its behaviour in the dyeing experiments, as the spectrophotometric evidence obtained could not be used for calculation, although the spectra did indicate some dye–surfactant interaction. Its dyeing behaviour suggests, however, that a complex is formed with each of the surfactants used, but that these compounds are not very stable to increasing temperature. Surfactant NP 30 appeared to be slightly more effective than NP 10 in forming a complex with this dye.

DYE III

The curves for percent dye complexed given in Fig. 5 for this dye do not include curves for 85°C as at this temperature the spectra were that of the

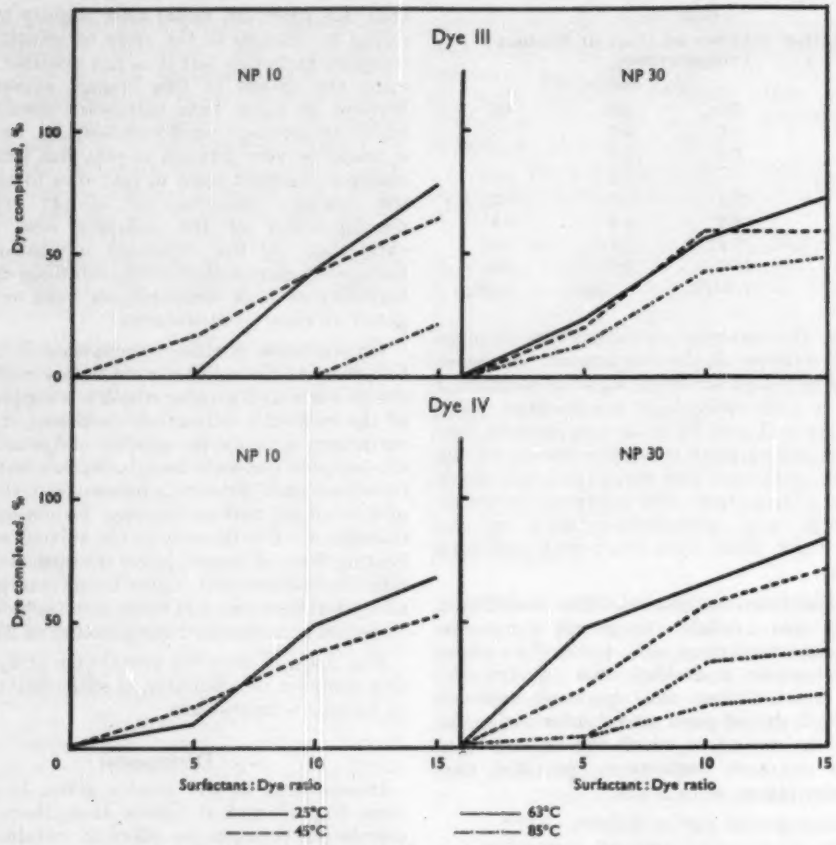


FIG. 5— Extent of complex formation at different surfactant : dye ratios

dye alone, i.e. any complex formed initially was completely decomposed at this temperature. However, the results of both spectral calculations and dyeing experiments indicate that this dye forms a complex to approximately the same extent with each of the surfactants used, NP 30 being slightly more effective than NP 10, but both complexes are completely decomposed at higher temperatures.

DYE IV

At all temperatures the amount of reaction with surfactant was very much greater for NP 30 than for NP 10, complex formation with NP 10 being absent at 63 and 85°C (Fig. 5). This trend is also shown by the behaviour of the dye in the dyeing experiments, the system containing NP 10 belonging to Class A, whereas that containing NP 30 system falls into Class C (Table II).

DYE V

This dye shows similar behaviour to that of dye IV in so far as NP 30 appears to be much more effective than NP 10 in forming a complex, particularly at higher temperatures. However, spectrophotometric and dyeing experiments indicate that surfactants affect this dye to a slightly greater extent than they do dye IV, particularly at higher temperatures.

DYE VI

This dye, like dye II, can be considered only on the basis of its dyeing behaviour, as the spectral results do not appear to be amenable to calculation, although they do indicate a certain amount of reaction with both surfactants. The dyeing behaviour, on the other hand, shows that dye uptake is reduced by addition of surfactant to the dyebath, the effect being more marked at the higher temperatures with NP 30 than with NP 10.

DYE VII

This dye follows the same pattern in dyeing behaviour as the spectrophotometric results indicate, i.e. there is considerable interaction between the dye and both surfactants, although again NP 30 is rather more effective than NP 10.

DYE VIII

The dyeing behaviour of this dye clearly indicates that it is by far the most affected of all the group by addition of surfactants, NP 30 giving the greater effect, but both surfactants cause a considerable decrease in the uptake of dye by the fibre. It is surprising, therefore, to find that calculations based on spectral curves indicate that a relatively small percentage of dye is present in the solution as a complex. However, these data do show that the complexes formed in both reactions

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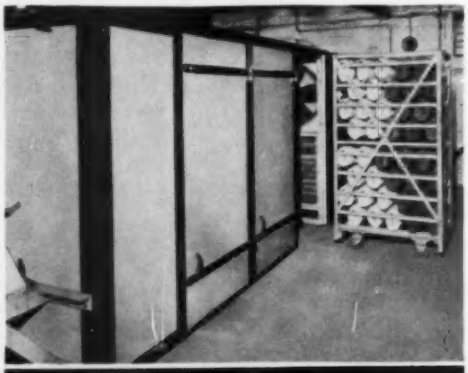

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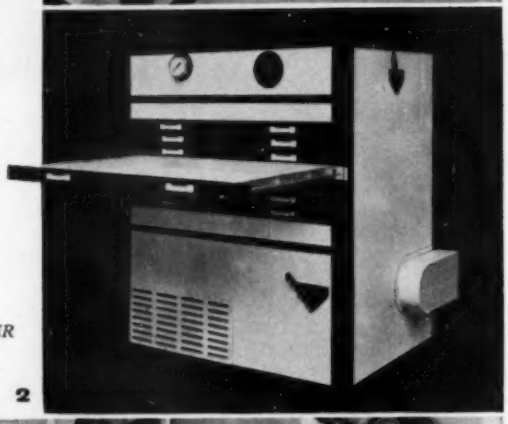

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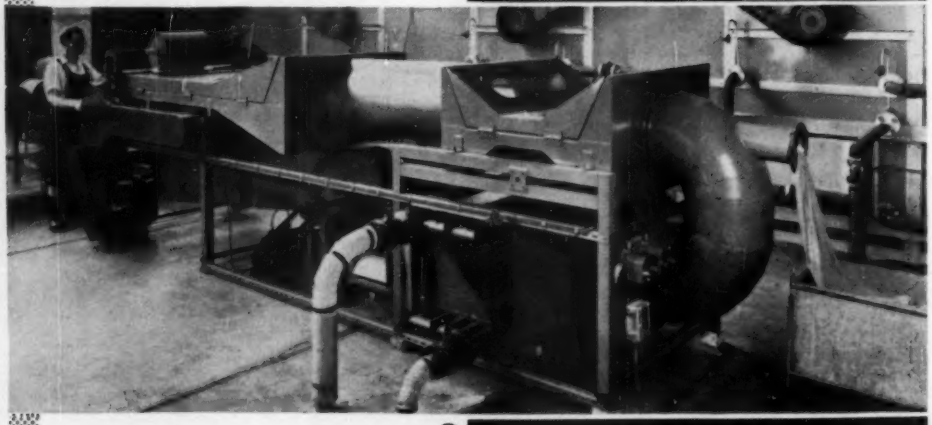

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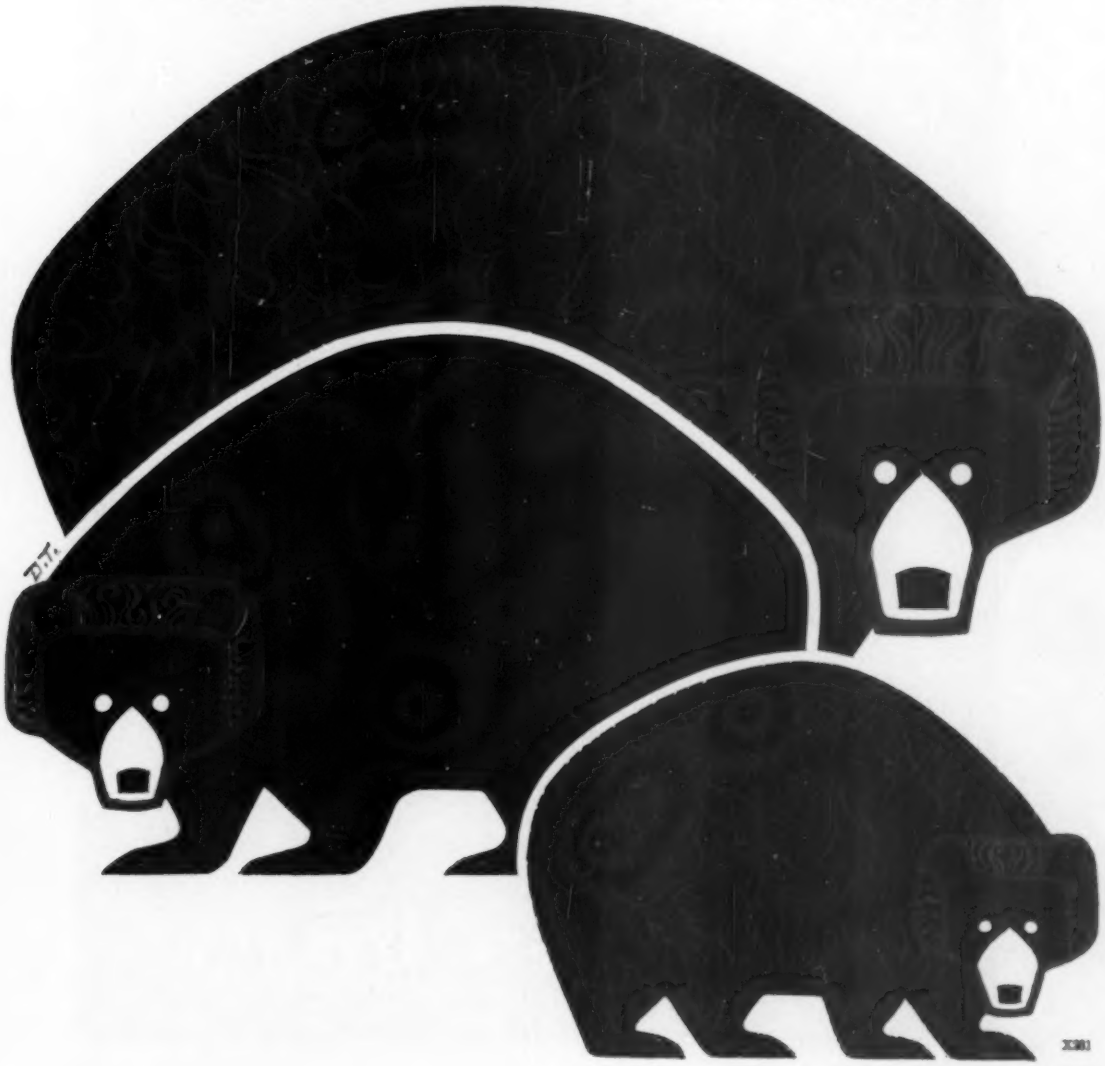

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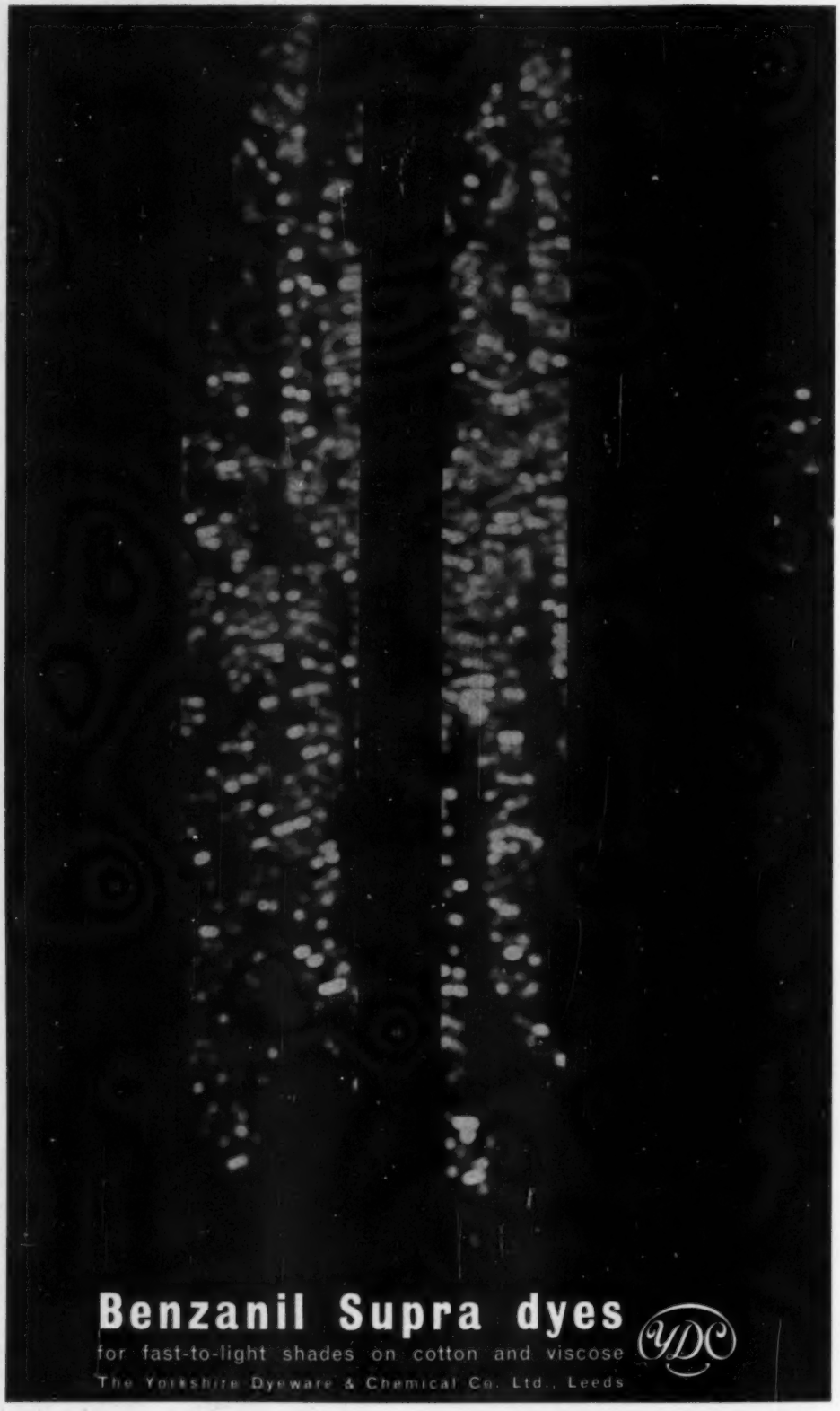
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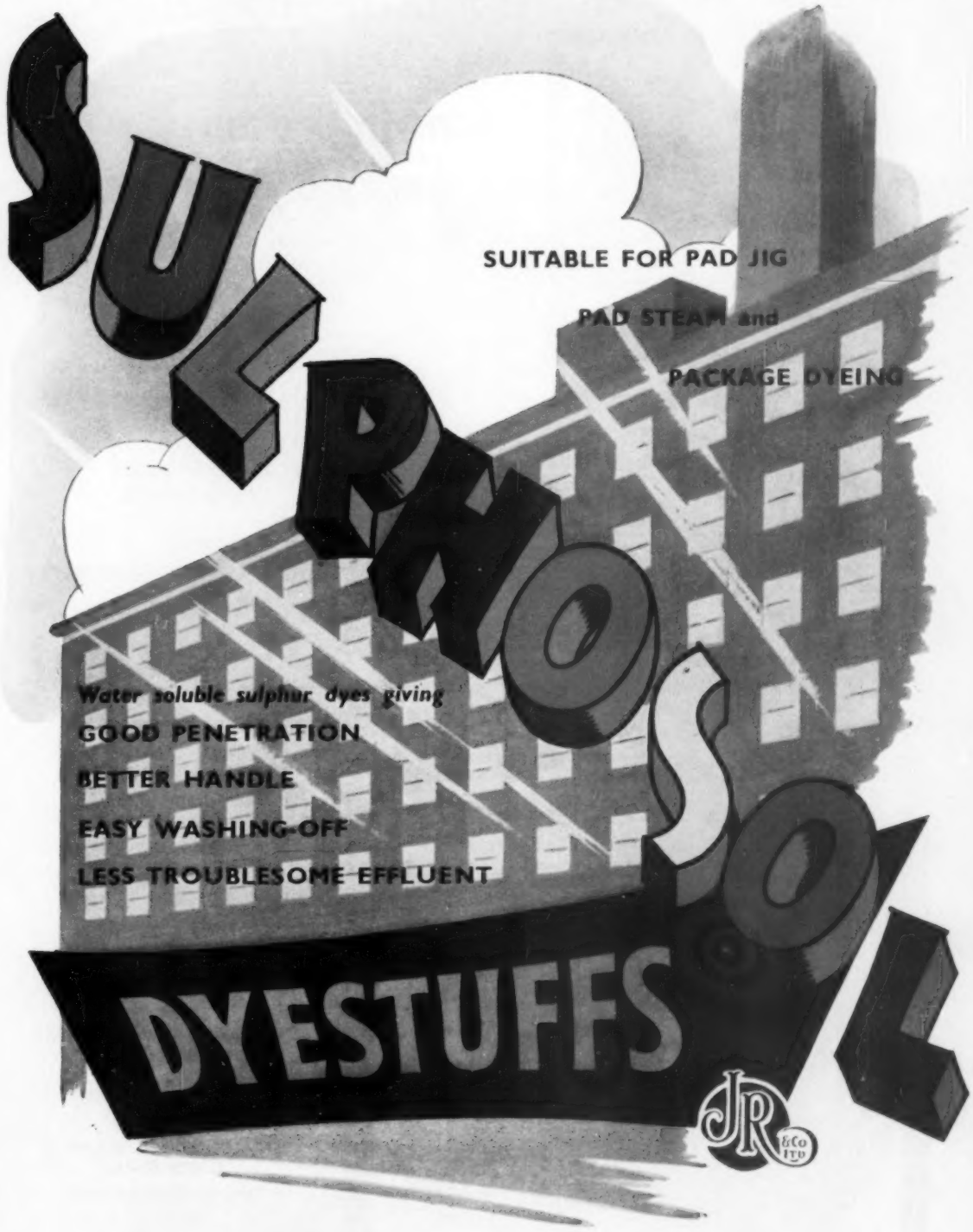

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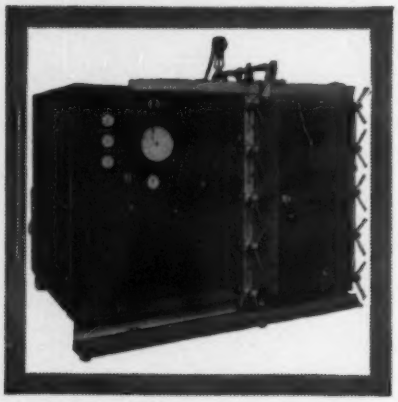

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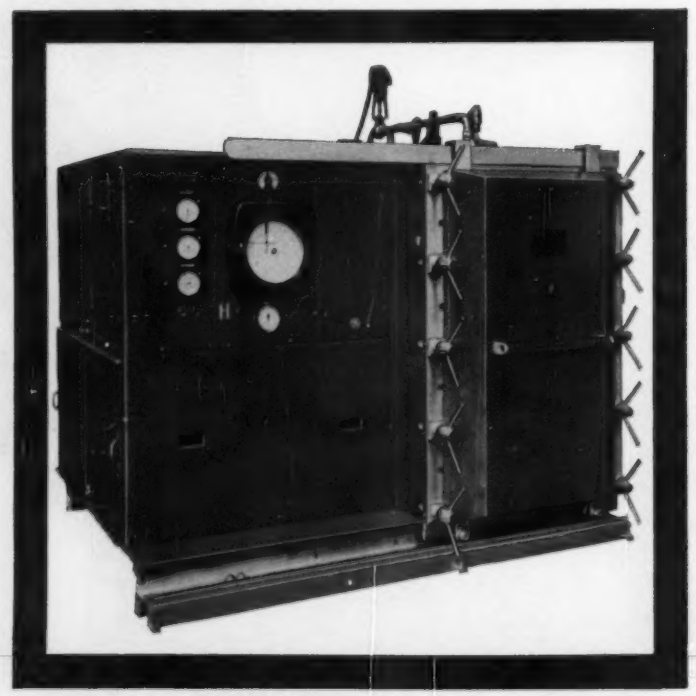

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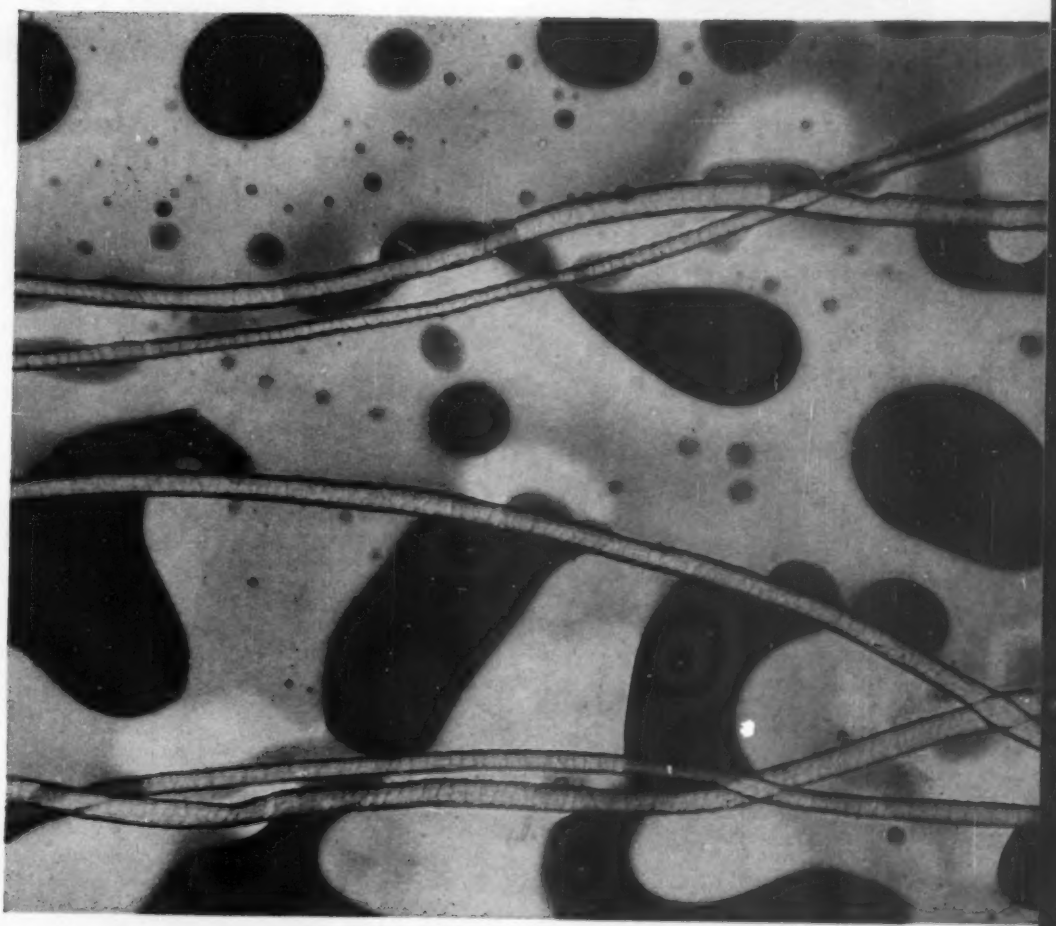

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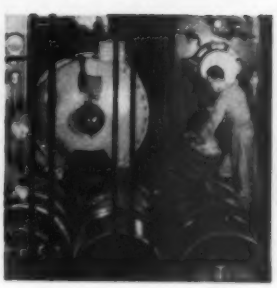

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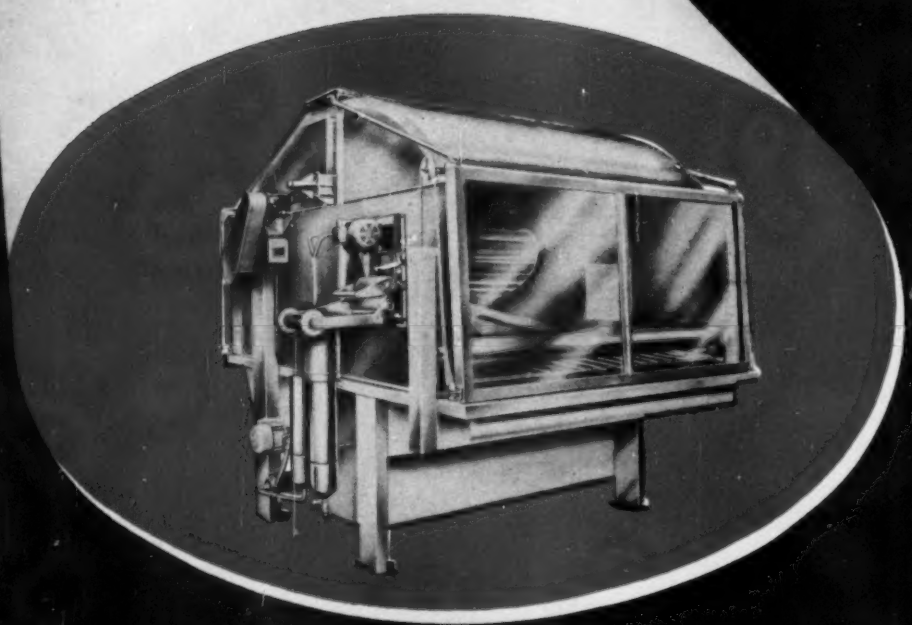

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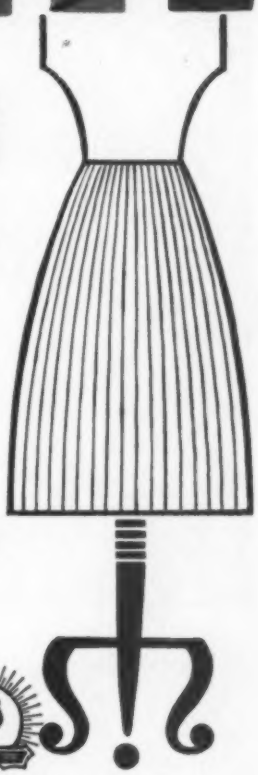

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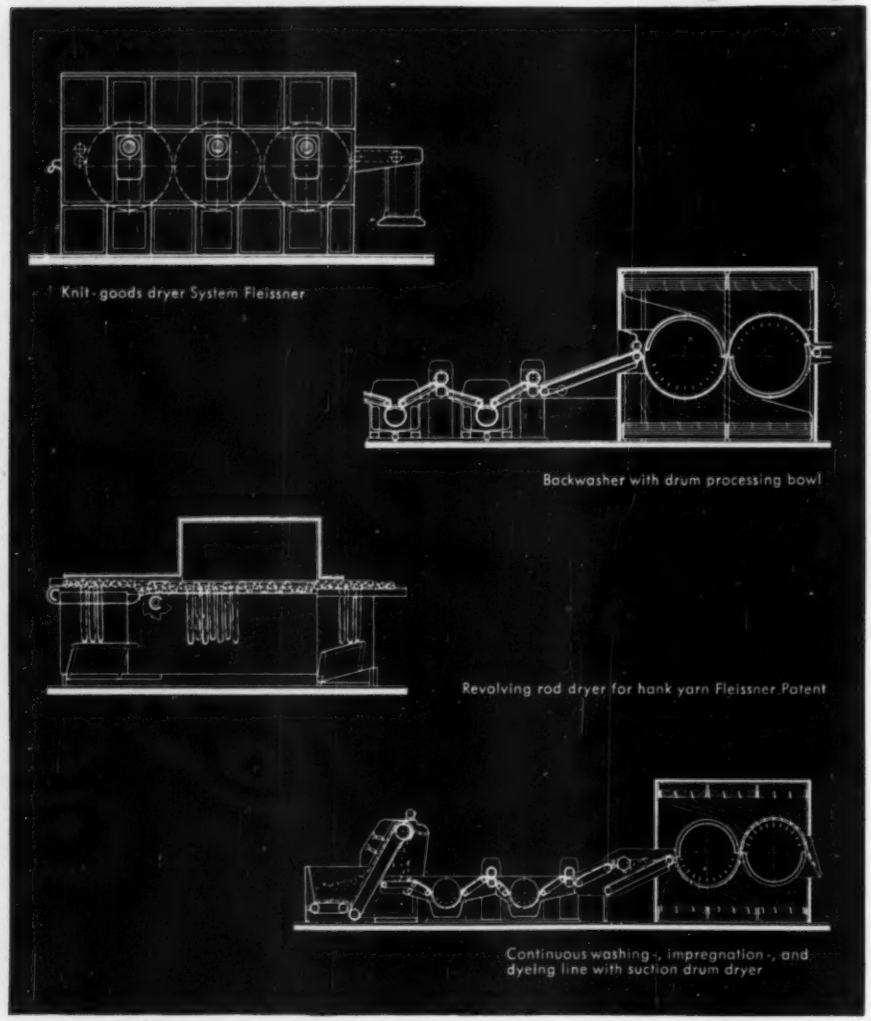
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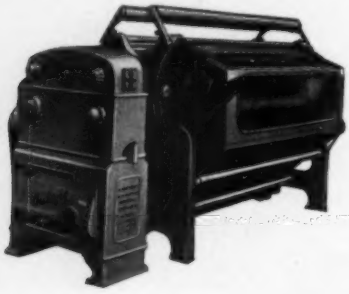

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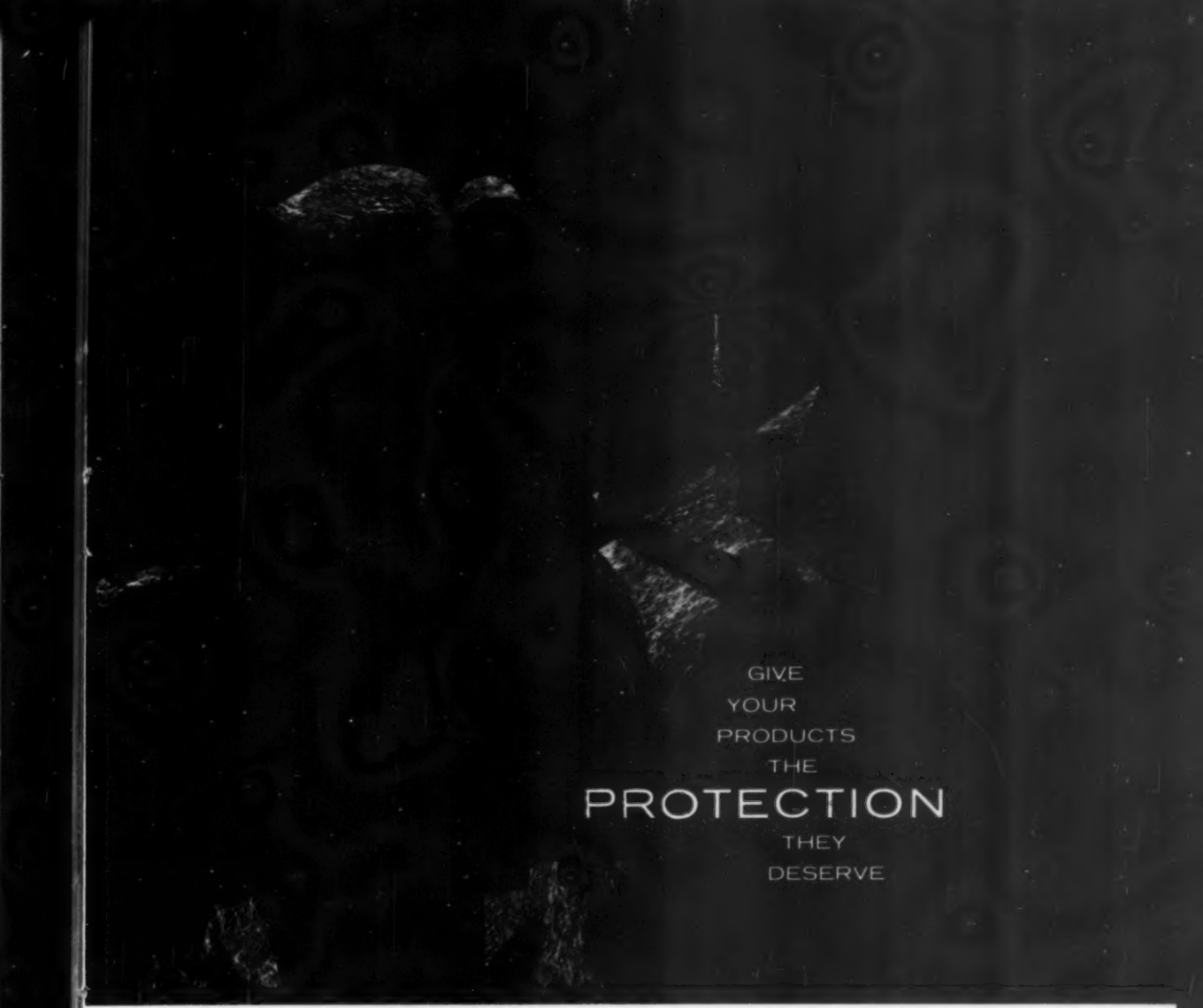

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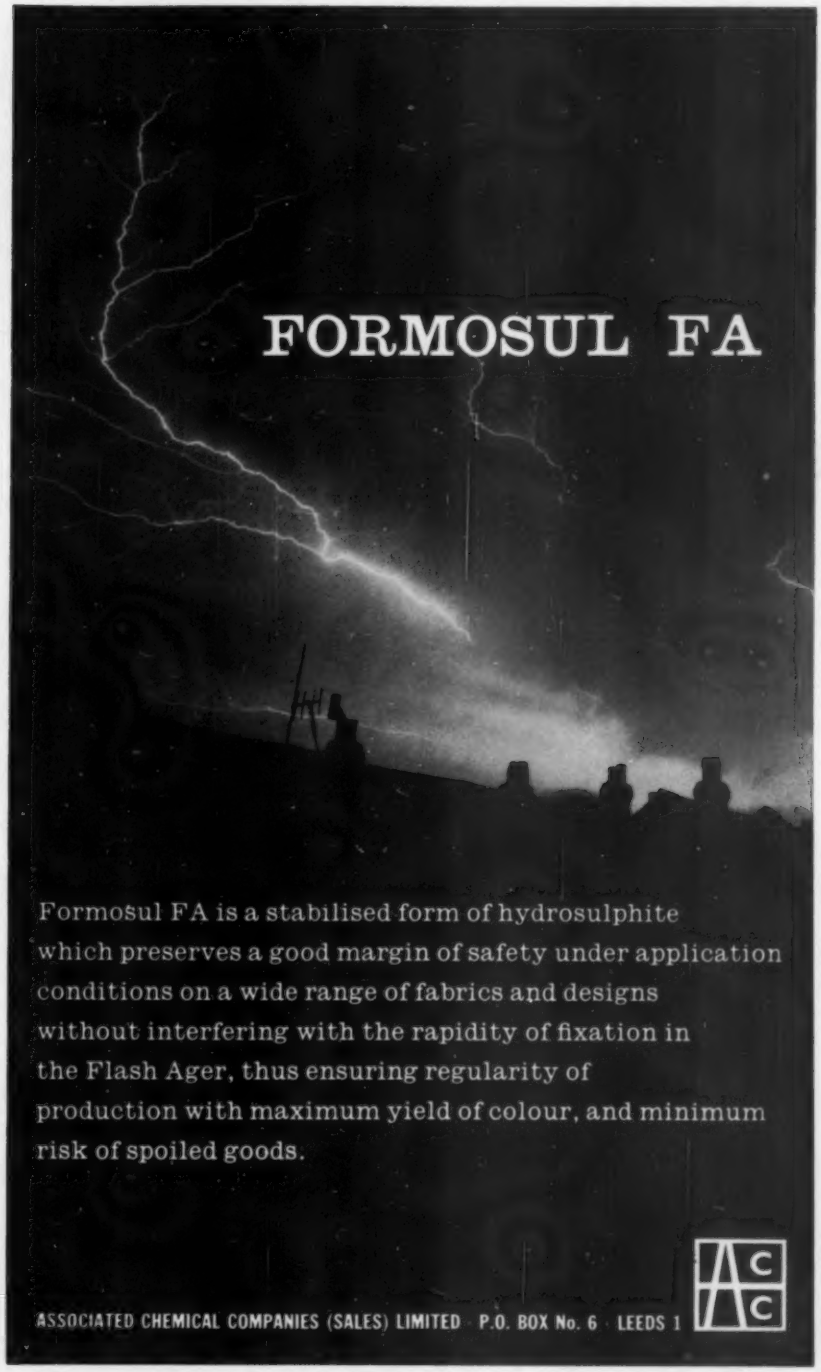
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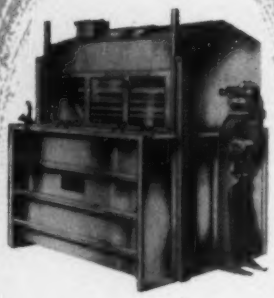

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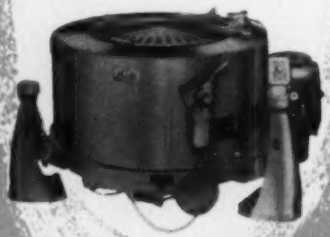

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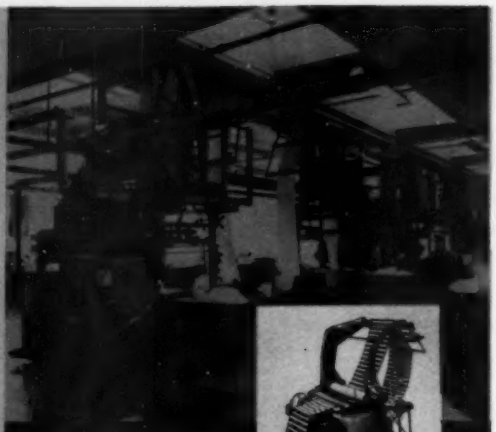

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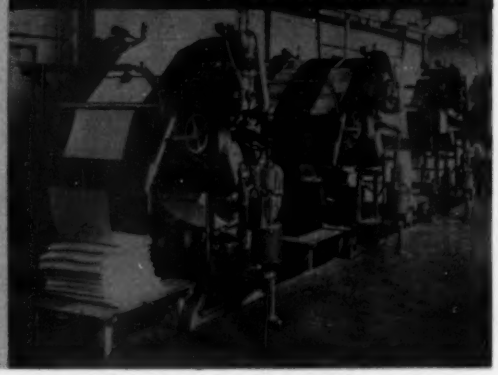

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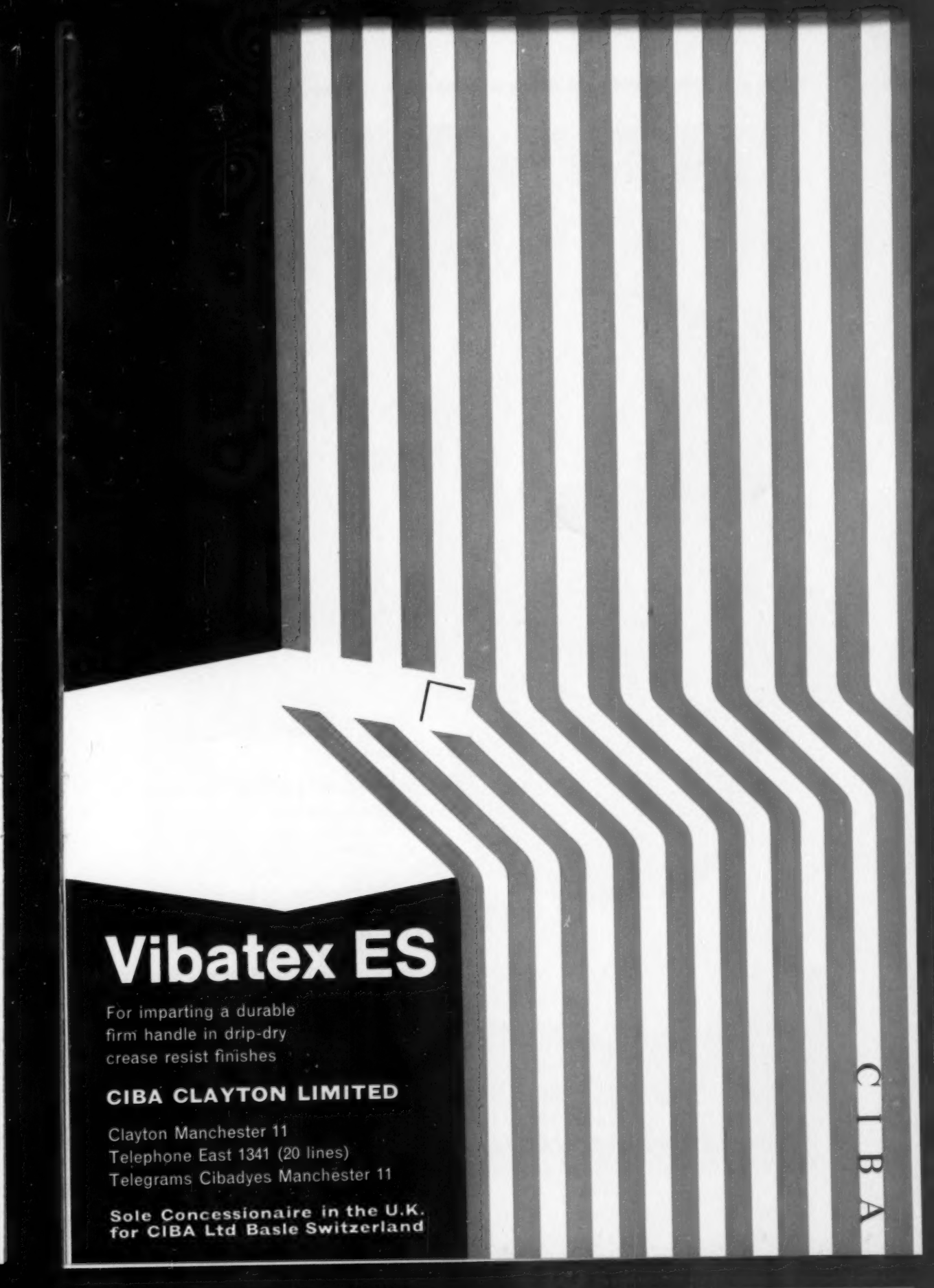
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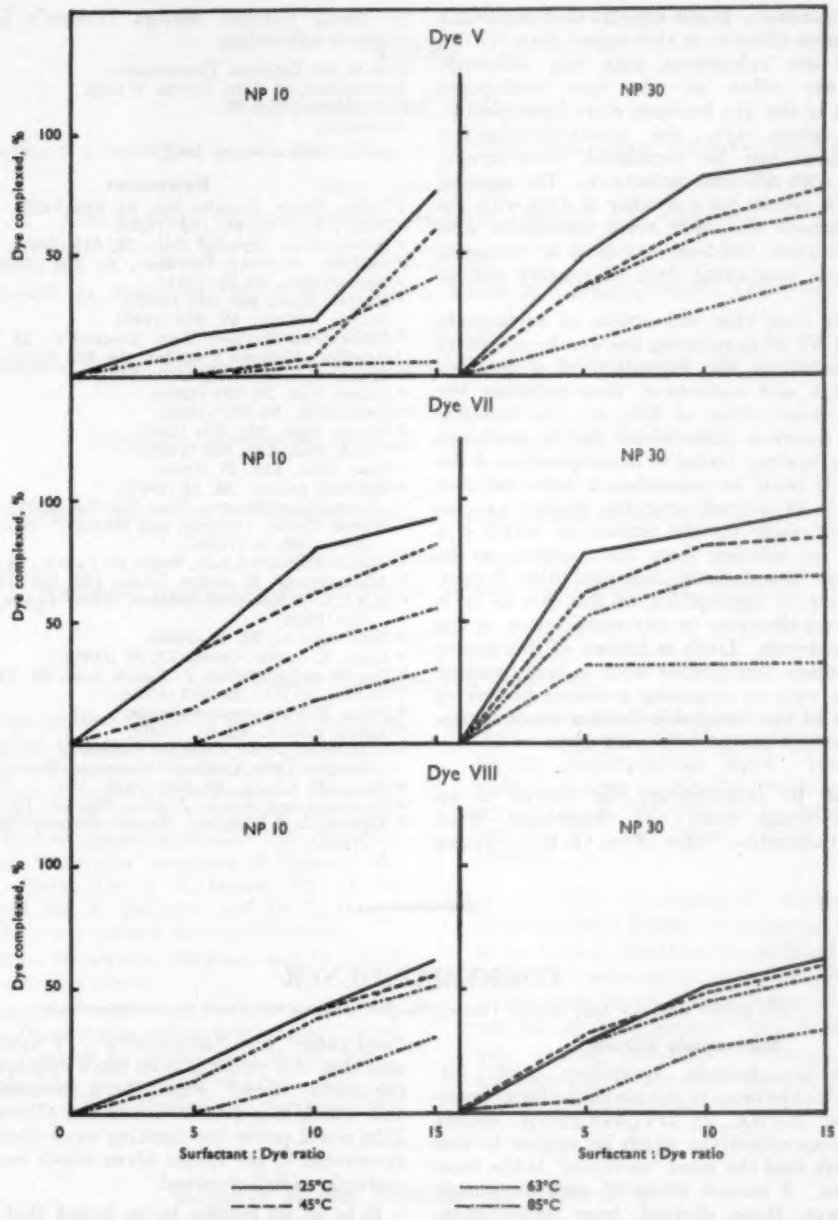

FIG. 6— Extent of complex formation at different surfactant : dye ratios

are more stable to increased temperature than those formed with any of the other dyes, and this could account for the results obtained. On the other hand, this dye is highly aggregated even at high temperatures (Table II), which means that assumption (1) on p. 309 does not necessarily hold for this dye.

Conclusions

The results of both dyeing and spectrophotometric experiments show that for all the systems examined there is an interaction between dye and non-ionic surfactant, but there is a wide variation in the extent to which the various dyes react with a given surfactant.

In general, the uptake of dyes by wool from a neutral dyebath increases with the ratio of hydrophobic to hydrophilic parts present in the dye molecule (as deduced from an inspection of dye structures), a trend which is shown by the dyes selected for this investigation.

Further, the results indicate that the extent to which a surfactant modifies the dyeing behaviour of a dye also increases as the hydrophobic nature

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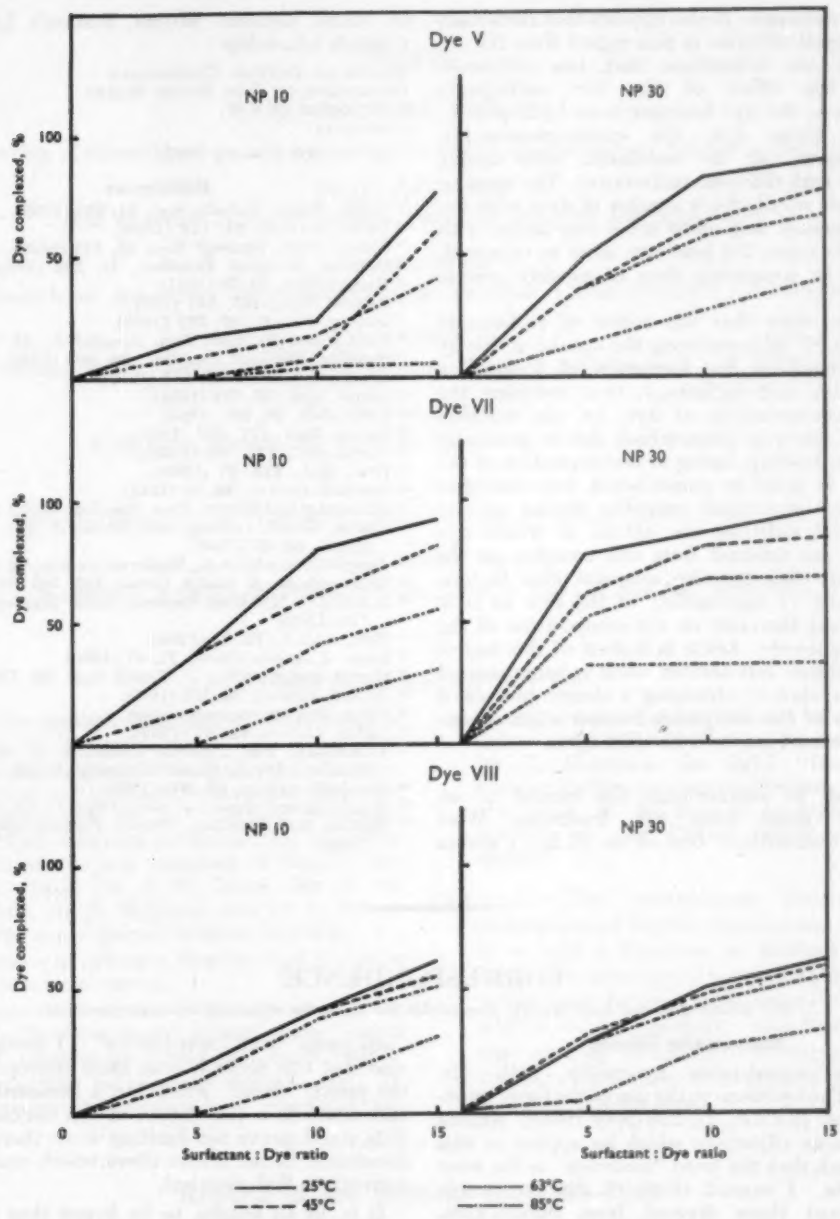

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Further, the results indicate that the extent to which a surfactant modifies the dyeing behaviour of a dye also increases as the hydrophobic nature

of the dye increases. It also appears that surfactant NP 30 is more effective in this regard than NP 10, but there are indications that this difference between the effect of the two surfactants diminishes as the dye becomes more hydrophobic.

For a given dye, the spectrophotometric measurements can be correlated with dyeing behaviour with different surfactants. The spectrophotometric results for a number of dyes with the same surfactant also show some correlation with dyeing behaviour, but here care must be exercised, especially in comparing dyes of roughly similar polarities.

It seems clear that the action of surfactants NP 10 and NP 30 in reducing the uptake of dye by wool is based on the formation of a complex between dye and surfactant, thus reducing the effective concentration of dye, i.e. the complex acts as a reservoir from which dye is gradually released on heating, owing to decomposition of the complex. It must be remembered, however, that the efficacy of control over the dyeing process depends not only on the extent to which dye molecules are released from the complex as the temperature rises, but also, amongst other factors, on the state of aggregation of the dye as it is released, and therefore on the composition of the complex molecule. Little is known of this aspect of the problem, but further work is being carried out with a view to obtaining a clearer picture of the nature of the complexes formed when a non-ionic surfactant reacts with acid dyes.

* * *

We wish to acknowledge the receipt of an equipment grant from the Australian Wool Research Committee. One of us (B.R.C.) wishes to thank General Motors Holden's Ltd for a research fellowship.

School of Textile Technology
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The Editor does not hold himself responsible for opinions expressed by correspondents

Man-made Fibres

I have considerable sympathy with Mr. à Brassard's objections to the use of the term "man-made fibres" (J.S.D.C., **77**, 210 (May 1961)). Among the numerous adjectives which he applies to this term I think that the word "incorrect" is the most appropriate. I cannot think of any man-made fibres except those derived from bubble-gum. The ones to which the term is applied are machine-made fibres.

I quite agree that what we need is another word and I suggest that use could be made of the prefix "arti-". One could thus speak of "arti-fils" or "arti-filaments" and of "arti-fibres" and even of "arti-yarns" and "arti-fabrics". I would suggest also that this prefix is even more appropriate than the prefix "chemi" which Mr. à Brassard suggests and which is a translation of the German prefix. This could prove too limiting since there may be discovered in the future fibres which could not be correctly called chemical.

It is, at all events, to be hoped that the word "man-made" will cease to be applied to any textile products at all.

L. E. Jones

12 Church Street
Liverpool 1

26th May 1961

Notes

Election of Fellows

At a meeting of Council held on 5th July 1961, the following were elected Fellows of the Society—

Ernest Eric Bowker

Sale, Cheshire; Technical Director, Industrial Dyestuffs Ltd, Manchester

Leonard Cooper

Charlesworth, nr. Manchester; Buyer and Company Consultant, United Africa Co. Ltd, Manchester

Clifford Duckworth

Baildon, Yorks.; Section Director (Production), Bradford Dyers' Assocn. Ltd, Bradford

Dennis Ronald Lemin

Withington, Manchester; Dyestuffs Technician, I.C.I. Ltd, Blackley

Raymond Thornton

Rhode Island, U.S.A.; Technical Service Manager, Arnold Hoffman & Co. Inc.

Lascelles Morton Wood

Wainstalls, Halifax; Managing Director, Norman Wood & Son Ltd, Bradford

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Council Meeting—3rd May 1961

Among the matters discussed at the meeting of Council on 3rd May were—

OFFICERS AND MEMBERS— Mr. Ramsay J. Hannay, President of the Society, was elected Chairman of Council, and Mr. R. C. Oakley, President-elect, Vice-chairman of Council. The President welcomed the new members of Council, Mr. C. O. Clark, Dr. J. F. Gaunt, Mr. H. R. Hadfield, Mr. K. McLaren, and Dr. L. Peters, and the newly elected Section Chairman.

MEMBERSHIP— 35 ordinary Members and 12 Junior Members were elected.

ANNUAL GENERAL MEETING AND ANNUAL DINNER 1963— These events will be held at the Central Hotel, Glasgow on Friday 26th April 1963.

REPRESENTATION ON OTHER BODIES— Dr. D. Patterson was appointed to represent the Society on the B.S.I. "Relation of Lovibond Colour Scale to C.I.E. System" Committee and Mr. L. Morris on the B.S.I. "Hardness of Rubber Rollers on Textile Finishing Machinery." Dr. H. W. Ellis is to represent the Society on the Colour Group of Great Britain.

I.F.A.T.C.C.— The International Federation of Associations of Textile Chemists and Colourists is to hold a Congress in Holland in April 1962. The selection of papers for presentation will be made by the Dutch Association, which will be the host society. The Federation is also making preliminary arrangements for holding a conference in the style of the Gordon Research Conferences.

Reports of the Sections for 1960–1961

HUDDERSFIELD SECTION

During this session nine lectures have been held, the average attendance being 46. As in previous years, we arranged joint meetings with the Royal Institute of Chemistry, Huddersfield Textile Society, and Halifax Textile Society. We were invited by the Halifax Textile Society to join them on the occasion of the lecture by Mr. P. Warburton on *Application of Colour Theory to Fibres, Yarns and Fabrics.*

This year, we broke with tradition by holding our Annual Dinner at Whiteley's Cafe, Westgate, Huddersfield. This was a most enjoyable evening, and 137 members and guests were favoured by an outstanding address by the President of the Society.

During the session, Mr. R. L. Robinson, one of our long-serving Committee members (he had served since 1939), and one-time Chairman of the Section, retired, and resigned from the Committee. His resignation was accepted with sincere regret. To fill the vacancy, Mr. Ralph Beaumont has been nominated.

May I conclude by once again thanking the Chairman and members of the Committee for their help during the past session.

HORACE TURNER
Honorary Secretary

LONDON SECTION

The London Section has had an active year, with a full programme of meetings and social events. Seven lecture meetings have been held at the Royal Society rooms, in addition to the Eighth London Lecture and the customary meeting at Luton.

The Section was privileged to be host at a meeting with the Dyeing and Finishing Sub-committee of the International Rayon and Synthetic Fibres Committee, when the President took the chair. Mr. J. G. Evans of the Bradford Dyers' Association spoke on *Necessity, Invention and Rayon.*

The Eighth London Lecture was given by Mr. S. J. R. Leeming of Samuel Courtauld & Co. Ltd. on the subject *Colour and Design in Dress Fabrics.* This lecture was of the usual high standard and attracted a very good attendance. The lecture at Luton was given by Dr. H. A. Thomas of Courtaulds Ltd, on the subject *Technical Aspects of Textile Marketing in Relation to the Dyeing and Finishing Industry.*

Attendances at meetings have generally been good, averaging 50 in London, with some 70 at the Luton meeting. Joint meetings have been held with the London Centre of the Guild of Dyers and Cleaners, and with the London Section of the Textile Institute.

The social events included a dinner after the London Lecture and also the Annual Dinner and Dance. Both events were supported by record numbers and we were honoured to have the company of the President and Mrs. Stevenson on these occasions. The season was concluded by the Annual General Meeting and Dinner.

The Section thanks Mr. R. Woods for his services as Chairman during the last two sessions and Mr. F. Harrison for his services as Honorary Treasurer since 1947. The award of the Society's Bronze Medal to him is much appreciated by the Section.

Membership of the Section has now recovered from the loss of members transferred to the new West of England and South Wales Section, and stands at the record figure of 241, including 6 Junior Members.

H. W. TAYLOR
Honorary Secretary

MANCHESTER SECTION

During the year there was the usual programme of lecture meetings. In addition to a variety of subjects of immediate technological interest for members, topics of more general interest, e.g. the relation between science and industry, were discussed. A well-attended symposium was held, in conjunction with the Paper and Textile Chemicals Group of the Society of Chemical Industry and the Textile Institute, on Bonded Fibre Fabrics.

The Summer School, held at the College of Science and Technology, dealt with the important topic of Fastness and the attendance was satisfactory. The standard of the lectures was high, a great deal of work having gone into the organisation of the practical classes, while the social atmosphere was very pleasant. The Society owes a great deal to the College and to the many firms, institutions, and individuals who co-operated with the Summer School Committee at all stages of the organisation.

A change of day and place of meeting at the beginning of the session brought about a most encouraging improvement in attendances at lectures. Meetings are now held in the head-quarters of the Manchester Literary and Philosophical Society.

The attendance at the annual dinner and dance taxed the accommodation, and the event repeated the friendly spirit and the general enjoyment that have been the features of its predecessors.

The total membership of the Section is now 720.

K. MELDRUM
Honorary Secretary

MIDLANDS SECTION

During the session activities of the Section were enthusiastically supported by our members. An average attendance of over 100 was recorded for meetings in Coventry, Derby, Kidderminster, Leicester, Loughborough, and Nottingham. The scope of co-operation with kindred bodies has been widened. We had the pleasure of joining with the Textile Institute at Kidderminster, the British Association of Chemists at Derby, the Nottingham Textile Society, the Leicester Textile Society, and the Leicester branch of the Guild of Technical Dyers. Nine of the authors of papers read were section members. Gatherings of 250 at the Ladies' Evening in Leicester and of 180 at the Annual Dinner in Nottingham showed again the popularity of these social functions.

The members of the Section have continued to support the Society in Council, its Committees and functions. The sustained efforts of two of them have been noted in the award of the Gold Medal of the Society to Mr. W. A. Edwards and to Mr. W. Penn. Their loyalty and enthusiastic service are too well known to necessitate repetition, but the Section cannot let this opportunity pass without adding its thanks and good wishes. Congratulations are also offered to Mr. F. M. Stevenson on completing his term as President of the Society with such distinction. The Section thanks all these members, and the Section Committee and Officers, who have given so much time to the work of the Society, and the Section in particular.

The Section Committee has met six times during the year and had a pleasant summer outing to Blithfield Hall, with dinner afterwards at Ashby-de-la-Zouch.

We welcome our new Chairman Mr. J. C. Wright, assuring him of our support, and thank Mr. A. S. Cluley for his work for the Section at home and in

Council and for his continued service as Vice-chairman. Messrs. T. E. Charlesworth, W. L. Langton, W. L. Lead, C. A. Mills, and J. Saunders were re-elected to serve on the Section Committee.

A notable feature was the inauguration of Junior Branches at Leicester and Nottingham. We are especially indebted to Mr. W. Furness and Dr. W. L. Lead for their part in this. We know that the activities of these Branches will be supported by the Section.

J. RAYMENT
Honorary Secretary

NORTHERN IRELAND SECTION

Seven lectures were given this session, two being joint functions with the Textile Institute, and we had our usual social functions. Most of the lectures were of a practical nature, and were much appreciated by members. The attendances were well up to last year's average.

The Annual Dinner Dance was held at Woodbourne House Hotel on 21st October 1960. There was an attendance of 180 members and friends, and the guests included Mr. and Mrs. J. W. Nicholls.

Our Annual Dinner was held in Belfast on 27th March 1961, when we were pleased to have as guests our President, Mr. F. M. Stevenson, Mr. R. R. F. MacLennan, of I.C.I. Ltd., Mr. Wm. Carter, and Mr. J. W. Nicholls. This function was very well attended, and included a musical programme which was much enjoyed by the eighty people present.

We had two golf outings, one in the spring and the other in the autumn of 1960. Both were held at Castlerock Golf Club, and at the autumn outing wives and lady friends of members were invited. Both functions were greatly enjoyed by members and friends.

We again found it possible to donate five guineas from our Incidental Fund to the College of Technology, Belfast to be devoted, at the discretion of the head of the Bleaching, Dyeing, and Finishing section, to prizes for students attending these courses.

Mr. W. J. Watts completed the first of his two years as Chairman, and we look forward to his guidance during the forthcoming session. Five committee meetings were held during the session, and we are much indebted to the enthusiasm of committee members for the smooth running of the section.

We would like to use this opportunity to put on record our very best thanks to the firms and organisations who co-operate so willingly with us in supplying lectures and lecturers. We anticipate their continued co-operation, and look forward to having a further successful session in 1961–62.

JAMES PORTER
Honorary Secretary

SCOTTISH SECTION

We have just concluded another session, which the Committee has endeavoured to make interesting and enjoyable. We have held eight lecture meetings in Glasgow and one in Galashiels. In addition, we had our usual joint meeting with the local section of the Textile Institute and also our annual Ladies' Evening. On the occasion of the Ladies' Evening we were particularly pleased to welcome the President and Mrs. Stevenson and also Mr. Nicholls.

With one or two exceptions, attendances throughout the session have been somewhat disappointing when compared with those of the last two or three years.

The committee met twice during the session.

Sectional membership shows a modest increase compared with last year; although 15 new members were enrolled during the year, there were several transfers to other sections and resignations.

The Annual Golf Outing was again very successful and we were favoured by good weather.

In conclusion, I would express my very sincere thanks to our retiring Chairman, Mr. J. G. B. McCallum, and members of the Committee for their valuable assistance throughout the session.

F. ATACK
Honorary Secretary

WEST OF ENGLAND AND SOUTH WALES SECTION

The Committee which was elected at the inaugural meeting of this Section two years ago felt that, owing to the widely divergent interests in industry in the area, it would be necessary, if we were to obtain strong support, to provide papers with as general an appeal as possible, and to present them in the centres where industry is concentrated. It was our experience last year that meetings in Taunton were well attended, and as a result two were held there this year, one in Bristol and the other in Cardiff.

Attendance figures for the meetings held this session were—Taunton 28, 41; Bristol 31; Cardiff 20.

Of those attending the meetings and signing the register, 43 were connected with the textile industry, 35 with the leather industry, 12 with the paper industry and three with plastics. It was disturbing to note, however, that of the 43 from the textile industry, only three were from the West of England woollen industry.

It is the intention of the Committee to arrange meetings next session in the same venues, but in Cardiff the meeting will be a joint one with the Textile Institute. There is also to be a works visit. It is also hoped that members will make a great effort to ensure the success of the three-day Symposium to be held in Bristol in September.

J. N. LITTLEJ
Honorary Secretary

WEST RIDING SECTION

Under the chairmanship of Mr. John Rankin the section has held seven lecture meetings and a part-day Symposium on *New Dyeing Techniques* at Bradford Institute of Technology. A feature of the first Leeds lecture was the use of a closed-circuit television unit. Throughout the session the accent has been on new developments in the dyeing and finishing industries, culminating, on the evening of the A.G.M., with a review of *Four Decades with Dicel* by Mr. A. J. Wesson. The average attendance at lectures was 55, and that at the part-day Symposium 140.

We reverted to our former practice of holding a Supper and Smoker at the beginning of the session, which was a successful event. Our Annual Dinner and Dance was once again an enjoyable evening, although slightly fewer were present than in previous years.

The number of entries for the Dyers and Finishers' Association Competition for the Junior Members was more satisfactory this year, there being 12 entries. The first prize was awarded to Mr. T. M. Baldwinson, a first-year student at Bradford Technical College, and three prizes of equal value to Mr. J. Elliott, a second-year post-graduate student of Leeds University, Mr. M. B. Roberts, a third-year student of Leeds University, and Mr. J. K. Hanson, a part-time student of Bradford Institute of Technology.

The Section committee met on five occasions.

ESMÉE SMITH
Honorary Secretary

BRADFORD JUNIOR BRANCH

The Branch held six evening lectures, at which the average attendance was 30. These meetings were held in The Bradford Institute of Technology, and thanks must be expressed for the full co-operation of the Institute in arranging these meetings.

There has been no social function during the last year owing to the lack of support at previous dances. This matter has been fully discussed with the committee of the senior Section, but no solution could be found.

We have found that lectures on more general subjects than those directly concerning the textile industry have proved more popular, e.g. *Principles of Colour Photography*.

W. R. HERMES, JNR.
Honorary Secretary

LEEDS JUNIOR BRANCH

A programme of six lectures and films was held during the session. The subjects covered a wide field of the tinctorial arts and the papers were well received.

Three visits were made during the session, to Messrs. Resinous Chemicals Ltd., Newcastle; Quickfit & Quartz Ltd. at Stone; and Hickson & Welch Ltd., Castleford. All these visits proved of great interest to members.

Our smoker was held in November and once again was a great success.

J. ELLIOTT
Honorary Secretary

MANCHESTER JUNIOR BRANCH

Six meetings have been held during the session. The average attendance was 42, compared with 35 last year.

The number of papers submitted for the February Members' Lectures meeting was very disappointing and it is hoped that there will be a better response next year. The 5 gns. prize, presented by the Manchester Section, was awarded to Mr. J. Shore for his paper on *Identification of Dyes on the Fibre*.

The membership of the Branch is now approximately 55. The Branch thanks all our lecturers who have combined to provide a most interesting and instructive programme during the session.

W. R. LEIGH
Honorary Secretary

SCOTTISH JUNIOR BRANCH

As usual the Branch held six scientific meetings during the session, one of which was a joint meeting with the Textile Institute. Attendances at meetings proved to be more variable this year, ranging from excellent to rather poor, the numbers present apparently depending on the state of the weather and the proximity of local college examinations.

To augment the lecture programme, the Branch held a textile film evening which proved an outstanding success, and the session was rounded off by three successful works visits to Fibreglass Ltd., A. F. Stoddard & Co. Ltd., and The Seedhill Finishing Co. Ltd.

Membership of the Branch continues steady, transfers to other sections cancelling any increase due to addition of new members. Members are, however, urged to do all they can to interest fellow students and colleagues in the Society so that we may increase our numbers further.

R. MCDONALD
Honorary Secretary

Sixth I.S.O. Conference on Colour Fastness

The sixth meeting of the subcommittee responsible for developing internationally accepted test methods for determining the colour fastness of textiles (I.S.O./TC 38/SC 1) took place in Cheltenham on 9th–12th May 1961. The conference was formally opened by the President of the Society, Mr. R. J. Hannay, who welcomed 58 delegates from 16 countries (a record number) and stressed the importance of the past, present, and future work of this very active subcommittee.

The United Kingdom delegation consisted of 12 members of the Fastness Tests Co-ordinating Committee and the Heat Treatments and Dry Cleaning subcommittees, under the leadership of Mr. K. McLaren, Chairman of the F.T.C.C. Dr. P. W. Cunliffe, immediate past chairman of the F.T.C.C., was unanimously elected Chairman of the conference and was given a standing ovation at its close. Four plenary sessions were held and five Working Groups met, their Chairmen being: Light and Weathering— Dr. E. Brunnschweiler (Switzerland); Washing— Mr. M. L. Staples (Canada); Pleating and Setting— Mr. J. P. Niederhauser (France); Dry Cleaning— Mr. J. V. Summersgill (U.K.); and Standard Test Cloths— Mr. E. Wilson (U.K.).

Considerable progress was achieved at these meetings, complete agreement being reached on tests for washing, steam pleating, dry heat pleating and setting, vulcanising, chlorinated water, formaldehyde, and perspiration. This agreement will result in a fourth Draft Proposal for I.S.O. Recommendation being submitted to the parent Technical Committee for formal approval, and it is fortunate that in only one case will any significant change be necessary in the method published in the Second Edition of *Standard Methods for the Determination of the Colour Fastness of Textiles*; on the contrary, the S.D.C. No. 2 and No. 4 Washing Tests have now been accepted internationally, together with the mechanically conducted Hand Washing and Mechanical Washing A and B tests.

The social side of this conference was equally successful. On the Wednesday afternoon two coaches took delegates and their wives on a tour of Cotswold villages with afternoon tea at the Moor Court Hotel, Amberley, this excursion being organised by Ciba Clayton Ltd.; on Thursday evening a dinner was given by Imperial Chemical Industries Ltd. Dyestuffs Division at which Mr. G. S. J. White, who had himself been a delegate at previous meetings in Bournemouth and Scarborough, welcomed the guests and paid tribute to the results obtained; Mr. H. A. R. Binney, C.B., director of the British Standards Institution, replied on behalf of those present and paid tribute to the work of the Society on colour fastness.

The organisation of the conference and of the clerical work was in the most capable hands of Mr. A. F. B. Nall and Miss J. K. L. McIntosh of B.S.I. Manchester, which forms, jointly with the A.S.A., the secretariat of this subcommittee.

K. McLaren

Chemical Cross-linking of Cellulose

The American Chemical Society's Division of Cellulose Chemistry held a symposium on this subject on 24th March 1961 as part of its 139th National Meeting. During it Dr. Guiliana C. Tesoro said that treatment of cellulose with mono- and bi-functional monosulphones (derivatives of vinyl sulphones) showed that the wet crease recovery of cotton was not significantly increased by simple substitution. It was, however, greatly increased by treating swollen cellulose with bi-functional monosulphones. Apparently, cyclisation products and side chains are ineffective in enhancing wet crease recovery, but formation of covalent cross-links does seem to enhance it.

J. Dusenbury and his colleagues found that methylene bromide improves the wet crease recovery of cotton, but treatment of alkali-cellulose with dimethylene bromide has little or no effect on dry crease recovery. The rate of reaction of alkali-celluloses prepared with caustic potash is more than double that of those prepared with caustic soda. The rate of reaction between methylene dibromide and sodium cellulosate (prepared by treating cellulose with sodium isoamylate in xylene) is much greater than that between the bromide and alkali-cellulose prepared with caustic soda. Both wet and dry crease recovery of cotton can be improved by treatment with acid formaldehyde and then baking. When sorbed formaldehyde and hemi-acetal were removed, the acetals could be removed by boiling in 1% acetic acid. Reduction in the acetal content caused reduction in both wet and dry crease recovery.

J. L. Gardon treated cotton with acid solutions of *N*-methylolacrylamide and then prepared the cellulose acrylamidomethyl ether. Treatment of this compound with free-radical catalysts caused homopolymerisation of the double bonds. Treatment of the compound with alkaline catalysts can cause reaction between the double bonds and the free cellulosic hydroxyl groups. The actual amount of cross-linking can be determined from measurements of double-bond, nitrogen, and methylene contents. Treatment with both types of catalysts improved both wet and dry crease recovery of cotton.

J. Rayburn and E. Jones found that a wash-and-wear finish prepared with diglycidyl ether improved the wet and dry crease recovery of cotton, and was in some respects superior to commercial finishes. However, it causes appreciable loss in tensile strength, more so than methyloltriazine finishes, and is expensive (*Chem. Eng. News*, **39** (10 Apr 1961) 54).

C.O.C.

British Industrial Biological Research Association

This research association was formed in 1960, with the support of D.S.I.R., to carry out toxicological investigations on substances used in the production, processing, and packaging of food and cosmetics. The establishment of a biological research station is currently being planned. Dr. Leon Golberg has recently been appointed Director

of the Association and will have the main responsibility for planning and executing the research work of the station. Dr. Golberg, who is 45, is at present Medical Research Director of Benger Laboratories Ltd., and will take up his new appointment later this year.

Association of British Chemical Manufacturers

At a meeting on 11th May 1961, the Council of the Association appointed Mr. H. W. Vallender as Deputy Director. Mr. Vallender, who is a graduate of Reading University, joined the Association in 1943 and since 1950 has been in charge of the Commercial Department.

Death of Members

We regret to report the death of Mr. N. Ellse, Dr. W. Meitner, and Mr. G. E. Styan.

Meetings of Council and Committees

June

Finance and General Purposes—6th
Diplomas—12th
Publications Committee *Journal* Subcommittee—15th
Colour Index Editorial Board—19th
Publications—20th
Bristol Symposium Technical Papers Subcommittee—22nd

New Books and Publications

Chemie und Technologie der Silicone

By W. Noll. Pp. xv + 460 with 101 fig. and 97 tables in the text. Weinheim/Bergstrasse: Verlag Chemie. 1960. Price, DM. 39.80.

The year 1960 served well those interested in silicones, since it saw the launching of two up-to-date reference books. In *Silicones* (J.S.D.C., **77**, (May 1961) 212) S. Fordham compiled and edited specialised texts written by his colleagues at Nobel Division, I.C.I. Likewise, in the book under review, Dr. Noll was able to draw on the services of experts whose experience in the field of silicone chemistry and technology was gained in the service of Farbenfabriken Bayer. A further common feature of these two books is their dual appeal to both chemist and technologist; moreover, the balance between science and technology is admirably maintained.

The first seven chapters (242 pp.) are devoted to a most thorough review of silicone chemistry. The basic raw materials, the organosilanes, are described, with details of methods of synthesis, chemical behaviour, and physical properties. Logically, the conversion of organosilanes to polysiloxanes comes next, and the hydrolytic methods used commercially are discussed, as well as numerous other methods of laboratory interest. The chapter dealing with the chemical constitution of the various types of silicone polymers, e.g. chain, branched, cyclic, and cross-linked polymers, should appeal even to the non-chemist, as it helps in a better appraisal of the commercial products with which the application technologist is concerned.

The next three chapters (163 pp.) will appeal most to the technologist. In chapter VIII he will find excellent reviews of the technology of (*a*) silicone rubbers, including vulcanisation processes, (*b*) silicone resins, including lacquers, and (*c*) silicone fluids, including the preparation of silicone emulsions. The next chapter lists a large variety of physical and chemical properties of these different types of silicone polymers, frequently in the form of graphs or tables. Chapter X deals with the application of technical silicone products in different branches of industry. In view of their versatility, which the author repeatedly emphasises, it is not surprising that practically every branch of industry is represented. Here the readers of the *Journal* will find a concise, yet highly informative, article on the usefulness of silicones as water-repellent agents in the textile industry. A review of the early methods of applying silanes and siliconates to textiles leads to the current practice of using highly condensed polymeric polysiloxanes. The two typical types in use are reviewed, viz. methyl hydrogen polysiloxanes and dimethyl polysiloxanes. An account of commercial silicone emulsions is followed by one on methods of application; both padding and substantive treatments are covered. The effectiveness of silicone proofing and its resistance to alkaline (soap) washing and dry-cleaning are mentioned, and so are the effect of silicones on handle and the tendency to increase slippage. Further, good accounts are given of the use of silicones in the related fields of leather and paper. A chapter on organic silicates and their relationship to silicones, and one on analysis complete this book. There is a comprehensive subject index.

The literature is surveyed up to and including October 1958, and there are some even more recent references. The text, in spite of its complex character, with its very many formulae and tables, appears to be almost entirely free from misprints. Printing, paper, and binding are of the highest quality.

It is not often that one can unreservedly recommend the purchase of a specialised text. Those who wish to deepen or broaden their knowledge of silicones can do no better than study seriously Dr. Noll's treatise. Its scholarly approach, coherence, and topicality make it easily the best book on this subject yet. This is an achievement of which Dr. Noll and his collaborators can be justly proud.

G. W. Madaras

Pyridine and its Derivatives—Part II

Edited by E. Klingsberg. Pp. x + 576. New York: Interscience Publishers, Inc. 1961. Price, 282s. 0d. (subscription price, 245s. 0d.).

Any attempt to bridge the enormous gap between accomplishment and text-book documentation in the field of heterocyclic chemistry is

welcome. The Interscience series *The Chemistry of Heterocyclic Compounds*, under the general editorship of Arnold Weissberger, of which the present volume is the fifteenth to be published, is especially welcome for its scholarship, comprehensiveness, and high standard of presentation.

The volume under review is a good illustration of the present-day pre-eminence of American publishers in the field of organic chemistry, especially in the matter of formulae and reaction schemes. These are kept very small, but perfectly readable; they do not obtrude into the text and, most important of all, are set out as a chemist would write them, and not in the way which is easiest for the printer, as so often happens in English publications.

The book consists of six separate literature reviews—*Quaternary Pyridinium Compounds*, 95 pp. (537 refs.), and *Pyridine N-Oxides*, 57 pp. (5 tables; 194 refs.), by Elliott N. Shaw; *Alkylpyridines and Arylpyridines*, 144 pp. (15 tables; 792 refs.), by Leon E. Tenenbaum; *Halopyridines*, 121 pp. (19 tables; 454 refs.), by Holly E. Mertel; *Organometallic Compounds of Pyridine*, 48 pp. (19 tables; 211 refs.), by Harry L. Yale; and *Nitropyridines and their Reduction Products*, 77 pp. (20 tables; 238 refs.), by Renat H. Mizzoni.

A detailed criticism of this book is beyond the competence of the reviewer and, indeed, could hardly be made by the narrowest of specialists, since in a literature review of this magnitude, the authors have a rather mechanical job to do, and there is no place for opinion or controversy, or even verbosity. Apart from chemical terms, a vocabulary of a few hundred words suffices, and the style is standard "chemicalese"; changes in style from one author to another are scarcely detectable, the huge mass of material enforcing anonymity. There is, however, a laudable unpretentiousness, and the occasional colloquialism adds piquancy and always brevity. This type of chemical reporting can hardly be challenged on grounds of scientific accuracy or partiality; the correct yardstick is that of comprehensiveness, and here the work cannot be faulted. Ten publications in the field chosen at random all appeared in the list of references.

It is hard to see how this book could be improved upon; with its companions it will, in any case, form the standard work in English on pyridine chemistry. It is fortunate that the work is being done so well.

D. G. Lewis

Index of Chemistry Films

Pp. 197. London: The Royal Institute of Chemistry. 1961. Price, 5s. 0d.

Any catalogue must, of necessity, be basically a list of items either annotated or merely stark. This particularly well produced publication is amply supported by detailed explanations wherever these can serve any useful purpose. It is a valuable standard work of reference. Do you need to "put across" the technique of sampling; the story of Calder Hall; the manufacture of viscose rayon; how wines are made; the correct use of the microscope? Perhaps you are to give a talk on electroplating; Faraday; nitrogen; or wool cloth manufacture, and need some illustrative material, if not for showing to your audience then to refresh your own knowledge. Whatever your need, then within the confines of the 1500 or so items listed in this publication you will find either film or filmstrip visual aids to help you.

Even though the number of interesting items is small when the rather circumscribed activities of members of the Society are considered, there is such a spread of subject and such a variety of treatments listed that the chances of finding some help are wide indeed.

Why should there be such a dearth of films and film-strips directly related to our particular interests? Surely we are not lacking in desire or intention when the field of general education is under consideration, and yet the heading "Dyes and Pigments" rates only three entries and these are all from one source and not one can be classed as "recent". Under "Paint" 14 items appear; few relate to colour, a subject which does not even appear in the index.

In brief, this most informative and useful catalogue of available films and film-strips on chemistry and related topics emphasises to no small degree the neglect which the coloration industry has displayed in relation to this most useful and acceptable medium. The publishers state their intention to publish new editions of this catalogue at suitable intervals. It is to be hoped that our industry will be better represented by the date of the next edition.

R. J. Smith

Buyers' Guide of Chemicals, Chemical Plant and Laboratory Equipment 1961

Pp. iv + 178. London: Society of Chemical Industry. 1960. Price, 7s. 6d.

The 1961 Buyers' Guide is divided into three sections—chemicals (pp. C1–C58), chemical plant (P1–P68), and laboratory equipment and apparatus (L1–L52). Each section begins with an alphabetical list of firms, together with their addresses. Chemicals are arranged alphabetically, there being both individual (e.g. acrylonitrile) and group (e.g. wetting agents) entries. The other sections follow a similar pattern.

M.T.

Abstracts from British and Foreign Journals and Patents

The titles of abstracts may be modified. Abbreviations of names of firms are listed in J.S.D.C., **68**, *23 (Jan. 1952) and also, together with symbols and the periodicals abstracted, in the annual index*

I—PLANT; MACHINERY; BUILDINGS

PATENTS

Carbon Black Furnace

Phillips Petroleum Co. *BP* 866,617 (U.S.A. 19 Nov 1957)

Describes a monolithic cast Carbon Black furnace which is easy and inexpensive to produce and which has a long and useful life. C.O.C.

Apparatus for Obtaining Even Dispersion of Pigments, Dispersed Gas or the like in Solutions for producing Man-made Fibres

J. Fulier *BP* 866,336 (12 Aug 1957)

Open-width Washing Machine

Benteler-Werke *BP* 859,742 (Germany 22 June 1957)

The material is guided in a zig-zag path around rollers placed alternately above and below the liquor. In the liquor there are web-displacing rollers, each of non-circular cross-section, situated between adjacent runs of material. These rollers rotate freely and, while being driven by the material running against them, repeatedly urge adjacent lengths of material apart from one another. C.O.C.

Passing Liquor or Gas through Textile Webs

R. Augsten *BP* 859,763 (Germany 12 Nov 1957)

Textile webs are dehydrated, impregnated, or dried by passing them over a suction slot having beneath it a cylindrical brush whose bristles project into the slot. The brush rotates and its circumferential speed is that at which the web passes over the cloth. The brush bristles take over the web from the leading edge of the slot without imparting tension and convey it to the other edge of the slot. This enables delicate fabrics to be treated without any risk of damage. C.O.C.

II—WATER AND EFFLUENTS

Water Consumption in the Textile Industry

W. Husmann *Textil Praxis*, **16** (Jan 1961) 59–66

The author examines the domestic and industrial consumption of water in Federal Germany with particular reference to the textile industry. Effluent treatment and disposal is a serious problem, being aggravated by the increasing use of synthetic detergents which resist decomposition and give rise to persistent foam. L.A.T.

Disposal of Industrial (Textile) Effluents

G. Thomaschk *Textil Praxis*, **16** (Jan 1961) 56–59

Discusses the requirements of Federal German Inland Waterway Authorities regarding industrial effluents. In order to minimise the pollution of inland waterways the effluent must conform to certain standards with regard to dissolved and suspended matter, pH, and oxidising character, as expressed by $KMnO_4$ requirements and biological oxygen demand. L.A.T.

III—CHEMICALS; AUXILIARY PRODUCTS; FINISHING MATERIALS

Recent Developments in Textile Chemicals

A. F. Kertess *Dyer*, **125** (10 Mar 1961) 366–375

Survey of new products: fibre lubricants; protective colloids; surface-active, reducing and levelling agents; a chlorine carrier; cationic and anionic softeners; resins; antistatic agents; water-repellent agents; an improved flame-resistant finish; wetting, emulsifying, dispersing, solubilising, gelling, antifoaming and fluorescent brightening agents. Data are included on reactive dyes and resin finishing; bleaching and surface-active agents; detergents; a new range of cationic chemicals; and two chlorination processes. R.A.P.

Surface Tension and Critical Micelle Concentration in Aqueous Solutions of β-D-Alkyl Glucosides and their Mixtures

K. Shinoda, T. Yamaguchi, and R. Hori

Bull. Chem. Soc. Japan, **34** (Feb 1961) 237–241 (*in English*)

Surface tensions of aqueous solutions of β-D-alkyl glucosides and their mixtures have been determined at 25°C. The critical micelle concentration (CMC) is found to decrease with increasing length of the alkyl group and a theoretical explanation of this is given. The effects of added salts on surface tension and CMC have also been studied. W.R.M.

Reactivity of Some Epoxides toward Cellulose

R. Steele *Text. Research J.*, **31** (Mar 1961) 257–262

The reactivity of 25 mono- and di-epoxides toward cellulose under hot anhydrous acidic conditions was investigated, using a small-scale procedure. The epoxides were emulsified in aqueous zinc perchlorate and applied to small pieces of cotton cloth which were then baked. The extent of reaction was followed by changes in fibre density, solubility in cuprammonium hydroxide, and crease recovery. The last two were important only with difunctional reagents. The compounds used were principally aliphatic and alicyclic epoxides of mol. wt. 70–300. The results suggest that if an epoxide is to react with cellulose under these conditions, it must be non-volatile, water-soluble to some extent, and free from certain sorts of steric hindrance. C.O.C.

2-*o*-Anisylimino-3-*o*-anisyl-4-thiazolidone, 3-*o*-Anisyl-2,4-thiazolidione, 2-*o*-Phenetylimino-3-*o*-phenetyl-4-thiazolidone, 3-*o*-Phenetyl-2,4-thiazolidione, and the Fungicidal Activity of the Acetoxymercuri Derivatives of the Thiazolidiones

P. N. Bhargava, K. Bhargava, and R. C. Kapoor

J. Indian Chem. Soc., **38** (Jan 1961) 23–26

The syntheses of the title cpd. and their characteristic reactions are described. 3-Acetoxymercuri-*o*-anisyl-2,4-thiazolidione, when tested for fungicidal activity against the fungus *Alternaria solani*, is found to inhibit germination completely at above 66 p.p.m. and the phenetyl analogue against *Fusarium navile* checks germination of the spores at above 26 p.p.m. H.H.H.

Organotin Compounds as Textile Preservatives

H. Anders *Textil Praxis*, **16** (Jan 1961) 50–51

It is reported that certain organic compounds of tin (tributyl oxide and hydroxide) are effective as moth-proofing agents on wool, whilst others (diethyl octyl and diethyl lauryl acetates) can be successfully used for rotproofing cellulosic materials. L.A.T.

PATENTS

Tetrafluoro-1,4-benzoquinone

FH *BP* 866,810 (Germany 17 Aug 1957)

Tetrafluoro-1,4-benzoquinone is obtained pure and in good yield by passing dry, vaporised tetrachloro-1,4-benzoquinone over dry KF at 175–350°C. It is a good fungicide and is markedly reactive, e.g. it oxidises 1-dimethylamino-4-aminobenzene to Wurster's Red. C.O.C.

Stabilisers for Hydrogen Peroxide and its Aqueous Solutions

Shell International Research Maatschappij *BP* 866,764 (U.S.A. 1 Dec 1958)

Compounds of formula $(MOOCR)_2N{\cdot}A{\cdot}N(RCOOM)_2$ (R = alkylene of 1 or 2 C; M = cation; A = carbocyclic ring system having 2 ring C atoms adjacent to one another and each directly linked to a $N(RCOOM)_2$ group), e.g. 1,2-diaminocyclohexane-*NN'*-tetraacetic acid, stabilise H_2O_2 and its aqueous solutions even at 100°C. C.O.C.

Starch Dispersible in Cold Water

Corn Products Co. *USP* 2,938,809 (10 June 1957)

Slight oxidation of a waxy type of starch so as not to reduce its stiffening power but sufficient to yield a product of high clarity, and then grinding, gives a product which, when shaken in water for 5 s, forms a full-bodied permanent stock solution of starch. C.O.C.

Size for Glass Fibres

Owens-Corning Fiberglas Corpn. *USP* 2,938,812 (21 Apr 1954)

Complexes of titanium esters are good sizes or anchoring agents for use on glass fibres, e.g. a mixture of 2% soln. of β-aminoethoxytitanium coconut acylate (45·6 parts by weight), imidazolene stearate (6·8), water (2220), and acetic acid (5 ml). C.O.C.

Softening Agent containing Urea and Hydrogenated Tallow Quaternary Ammonium Salt
Corn Products Co. *USP* 2,940,816 (25 Nov 1957)

A softening agent which is readily dispersed in cold water consists basically of a urea inclusive compound (*Prog. in Chem. of Fats and other Liquids*, **II**, 244–251 (Academic Press, 1954)) made from urea and distearylmethyltriethoxyethanol ammonium methosulphate. C.O.C.

Amido Thiosulphate Surfactants
Monsanto Chemical Co. *USP* 2,934,552 (16 May 1958)

Salts of *N*-(alkyloxyalkyl- or alkylthioalkyl)-2-(sulphothio)alkanecarboxamides are obtained by treating an *N*-(alkyloxyalkyl- or alkylthioalkyl)-2-halogenoalkanecarboxamide with an alkali-metal or NH_4 thiosulphate. Thus *N*-[3-(2-ethylhexyloxy)propyl]-2-chloroacetamide heated for 1 h with an aqueous solution of Na thiosulphate and alcohol, dried by distillation in presence of isopropanol, treated with charcoal, filtered and vacuum-dried, yielded the gum-like sodium *N*-[3-(2-ethylhexyloxy)propyl]-2-(sulphothio)acetamide. It has good detergent and wetting properties. C.O.C.

Alkali-metal Salts of n-Tridecyl Thiosulphate as Surfactants
Monsanto Chemical Co. *USP* 2,934,553 (21 May 1958)

The salts obtained by reaction of an n-tridecylhalide with an alkali-metal thiosulphate $n\text{-}C_{13}H_{27}X + R\text{·}S\text{·}SO_3OR \rightarrow n\text{-}C_{13}H_{27}\text{·}S\text{·}SO_3\text{·}OR + RX$ (X = Hal; R = alkali-metal), e.g. Na n-tridecyl thiosulphate, are excellent detergents in both hard and soft water and in presence of fatty solids. C.O.C.

Mixture of Alkyl Silane Triol and Aminoplast Resin for Imparting Water-repellency to Fibrous Materials
American Cyanamid Co. *USP* 2,937,155 (1 Mar 1957)

A mixture of a water-insoluble long-chain alkyl silane triol and a thermosetting aminoplast resin is applied to textiles, e.g. as an aqueous dispersion, and cured to yield a durable water-repellent finish. C.O.C.

Flame-retardant Composition for treating Organic Polymers
DuP *USP* 2,935,471 (10 Sept 1958)

A composition particularly suitable for rendering cotton flame-resisting consists of (1) 60–90% by wt. of NH_4 sulphamate and/or NH_4 sulphate and/or diammonium hydrogen phosphate and/or monoammonium dihydrogen phosphate, (2) 5–20% of a weakly basic, water-soluble nitrogenous compound, and (3) 5–20% of a water-soluble boron compound. Thus cotton cloth impregnated with its own weight of a solution of NH_4 sulphamate (49), diammonium hydrogen phosphate (21), anhydrous borax (15), dicyandiamide (15), Kreelon 4G (alkylaryl sulphonate) (0·7) and water (900) is dried at 100°C. When kept at 135°C for 60 min the treated cloth was not discoloured, whereas cloth similarly treated but in absence of borax and dicyandiamide was much discoloured. C.O.C.

Modified Amino–Formaldehyde Resins as Tanning Agents and as Fillers for Leather, Paper, Cloth, etc.
Jacques Wolf & Co. *USP* 2,944,046 (23 Sept 1952)

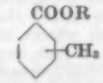
Formaldehyde is treated with an amino compound, e.g. urea, melamine or dicyandiamide, at 75–110°C. The product is then treated at pH < 7 with the same or another amino compound in amount sufficient to react with all the methylol groups present in the first resin. This yields a cationic resin which is stable in water and which does not further polymerise or condense when heated in presence of water. The product has good penetrating properties and is useful as a filler for leather, paper, cloth, etc. It is particularly useful, when mixed with an anion-active high-mol.-wt. organic compound containing at least one sulpho group, for tanning leather. C.O.C.

Mixture of Chloral Hydrate and a Dinitrile as Solvent for Acrylonitrile Polymers
Chemstrand Corpn. *USP* 2,941,972 (30 Dec 1957)

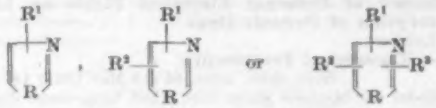
A mixture of 10–50% of chloral hydrate and 90–50% of succinonitrile, malononitrile or a cyclic alkylene carbonate (alkylene of 2–4 C) e.g. ethylene carbonate, dissolves acrylonitrile polymers to yield solutions which are stable at < 45°C. C.O.C.

Solvent for Polyethylene Terephthalate
Chemstrand Corpn. *BP* 865,869 (U.S.A. 8 Aug 1956)

Pyrrole; αα′-dihalogenated ketones, e.g. 1,3-dichloro-2-propanone; tolulates of formula—



(R = CH_3 or C_2H_5); methyl or ethyl benzoate; phenylacetonitrile; α-phenylpropionitrile; compounds of formula



(R = O, S or NH; R^1 = H or CH_3; R^2 and R^3 = CH_3), e.g. oxazole; and compounds of formula—

e.g. benzoxazole, are solvents yielding stable solutions of polyethylene terephthalate. C.O.C.

Solvents for Polyesters
Chemstrand Corpn. *BP* 866,220 (U.S.A. 25 June 1956)

The solutions obtained by dissolving polyesters in mixtures of phenol and water or phenol and resorcinol or chloralamide do not solidify at 40–43°C as does a solution in which phenol is the only solvent. C.O.C.

Solvent for Vinyl Polymers and Copolymers
American-Marietta Co. *BP* 867,278 (30 May 1958)

γ-Butyrolactone and/or its Alk (< 5 C) substituted derivative, together with an aromatic solvent which forms ≯ 93% by weight of the mixture, forms a very effective solvent for vinyl polymers and copolymers. C.O.C.

Coating and Impregnating Agents
Ciba *BP* 867,189 (Switzerland 2 Aug 1957)

Many dyeings and prints obtained by using acrylic resins as binding agents for pigments have their fastness to washing distinctly reduced after exposure to light. Use of acrylic copolymers containing as a component < 25% by weight of an ester of formula $CH_2{:}CR^1\text{·}COOR^2$ (R^1 = H or Alk of 1–4 C; R^2 = residue of a saturated cyclic alcohol) and an ester of formula $CH_2{:}CR^1COOR^2$ (R^2 = Alk or alkoxy) largely overcomes this defect. These copolymers yield elastic coatings having good adhesion to fabrics of all kinds and to paper. They are suitable as priming agents beneath polyvinyl chloride coatings and as binding agents for leather-coating colorants. C.O.C.

Isano Oil (V p. 330)
1,3-Dichloro-5,5-dimethylhydantoin as Bleaching Agent (VII p. 334)
Dimethyloltriazone Finishing Agents with Long-chain Alkyl Substituents for Cotton Textiles (X p. 339)
Rosin Size (XI p. 340)
Tanning with Glutaraldehyde (XII p. 340)

IV—RAW MATERIALS; INTERMEDIATES; COLOURING MATTERS

Optical Rotatory Dispersion of Dyes Bound to Macromolecules—Dye–Polyglutamic Acid Complexes
L. Stryer and E. R. Blout
J. Amer. Chem. Soc., **83** (20 Mar 1961) 1411–1418

Complexes formed by interaction of high-mol.-wt. polyglutamic acids and C.I. Basic Orange 14, pseudoisocyanine or *p*-(5-acetyl-4-methyl-2-thiazolylazo)-*N*-β-aminoethyl-*N*-ethyl-*m*-toluidine— a substituted toluidine–thiazole dye— gave optical rotatory dispersions over the pH range 4·2 to 6·5. Above pH 5·5 polyglutamic acid is in random configuration and the dye–polypeptide complex shows optical rotatory dispersion (O.R.D.) due to polypeptide alone. At pH < 5·1 the polyglutamic acid is in the α-helical conformation, and complexes with dye show anomalous O.R.D. in dye absorption band known as Cotton effect. Inflexion points of induced Cotton effects

are in good agreement with absorption max. of dyes, showing that dye chromophores acquire O.R. power upon binding with helical polypeptides. For a dye possessing a single absorption band, the signs of the induced Cotton effect are opposite for poly-L-glutamic acid and poly-D-glutamic acid. It is concluded that helices of opposite screw-sense show Cotton effects of opposite sign. Two models of the structure of such complexes are suggested and the possible use of this method in the elucidation of the structure of macromolecules of unknown conformation is mentioned. F.J.

Influence of External Electrical Fields on Light Absorption of Organic Dyes
H. Labhart

I— Theoretical Treatment
Helv. chim. Acta, **44** (15 Mar 1961) 447–456

Model calculations show that when long-chain dipoleless conjugated systems are subjected to an external electrical field, a displacement of the absorption bands towards the longer wavelengths is to be expected proportional to the square of the field strength and detectable by ordinary experimental methods.

II— Experiments with Polyenes *Ibid.*, 457–460

A method is described for the measurement of very small changes in wavelength, and now applied to the displacements caused by external electrical fields on the dimethyl esters of Crocetin and Bixin, with confirmation of the theoretical deductions of I. H.H.H.

Ultraviolet Absorption Spectra of Sulphones. IV— Effect of *ortho*-Substituents
V. Baliah and T. Rangarajan
J. Indian Chem. Soc., **38** (Jan 1961) 33–40

The ultraviolet absorption spectra are recorded and analysed of several arylmethyl sulphones ($ArSO_2CH_3$) and diarylsulphones. Several of these cpd. are new; their preparation is described. Bulky *ortho*-substituents do not seem to cause any significant inhibition of conjugation of the sulphonyl group with the benzene nucleus in the electronically excited state. The presence of one or more *o*-methyl groups in the diphenyl sulphones does not significantly alter the absorption max. but reduces the intensity, whereas two or more methoxy groups produce a bathochromic shift. H.H.H.

Ultraviolet Spectra of Derivatives of 1,3,5-Triazine
H. Koopman *Rec. Trav. chim.*, **80** (Feb 1961) 158–172

The syntheses of four 2,4-dichloro-6-(*p*-substituted phenyl)1,3,5-triazines are described, where the *p*-substituents are the methoxy, methylthio, methyl sulphonyl, and nitro groups respectively. Their u.v. spectra are recorded and compared with the spectra of deriv. given previously (cf. *Rec. Trav. chim.*, **77** (1958) 235; **78** (1959) 967; **79** (1960) 83). The effects of the various substituents are discussed from the electronic standpoint, and an explanation is given of the marked difference which exists between the spectra of the *p*-biphenyl deriv. and the corresponding (*p*-substituted)phenyl triazines. H.H.H.

Kinetics of the Acid-catalysed Hydrolysis of 4-(*p*-Sulphophenylazo)-1-naphthyl Methyl Ether and 4-(*p*-Sulphophenylazo)-anisole
J. F. Bunnett and E. Buncel
J. Amer. Chem. Soc., **83** (5 Mar 1961) 1117–1123

Rates and reaction constants for hydrolysis of title cpd. in hydrochloric or perchloric acid in absence or presence of potassium chloride or sodium perchlorate have been measured. 4-(*p*-Sulphophenylazo)-1-naphthyl methyl ether (I) is readily hydrolysed in dil. acid to the corresponding azonaphthol, by a first-order reaction with respect to oxonium ion. In conc. acids the rate increases to a max. at 2-M and is correlated with oxonium ion concn. Slow step of reaction scheme is general acid-catalysed detachment of methoxy group in (I) *via* an intermediate quinonoid protonated complex. 4-(*p*-Sulphophenylazo)-anisole (II) is less sensitive to hydrolysis, a rate max. being observed in conc. acids which cannot be correlated with oxonium ion concn. but is related to activity of water in acid soln. Suggested mechanism in this case is a nucleophilic attack by water on alkyl carbon atom of protonated (II) with consequent demethylation. pK_a values for (I) and (II) have also been found by photometry. F.J.

Aromatic Diazo and Azo Compounds. XXXVIII— Condensation of Aminonaphthol Derivatives with Acetaldehyde
Z. J. Allan and J. Podstata
Collection Czech. Chem. Commun., **25** (1960) 2559–2563 (*in German*);
Chem. Abs., **55** (20 Feb 1961) 3587

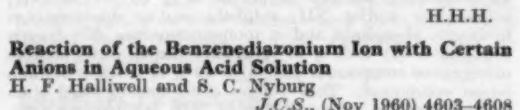
Condensation of J acid with paraldehyde or crotonaldehyde gave 4-methyl-8-hydroxy-1-azaphenanthrene-6-sulphonic acid, which coupled in the 7-position with diazotised orthanilic acid to give a light-fast azo dye. Similar reactions were carried out with γ acid. E.S.

Reduction of Diazonium Borofluorides by Sodium Borohydride
J. B. Hendrickson
J. Amer. Chem. Soc., **83** (5 Mar 1961) 1251

Diazonium borofluorides may be reduced in non-aq. or non-hydroxylic media with sodium borohydride by addition of the latter to a chilled methanolic soln. or suspension of the borofluoride. The resultant soln. is poured on to ice and hydrochloric acid to give a crude crystalline product. In no instance did the use of lithium aluminium hydride improve the yield. By this method amino, nitro or carboxyl groups which can be converted to diazonium groups may be replaced by hydrogen in aromatic rings. F.J.

Direct Introduction of the Diazonium Group. VII— Coupling of Toluene-*p*-sulphonazide with Phenoxide Ions to yield Diazo-oxides
J. M. Tedder and B. Webster
J.C.S., (Nov 1960) 4417–4420

Toluene-*p*-sulphonazide couples with reactive phenoxide ions to give a triazen which breaks down spontaneously to a diazo-oxide and the sodium salt of toluene-*p*-sulphonamide (I). In the necessarily basic conditions the diazo-oxide couples in turn with more phenoxide ions to yield the sodium salt of the azo dye.



H.H.H.

Reaction of the Benzenediazonium Ion with Certain Anions in Aqueous Acid Solution
H. F. Halliwell and S. C. Nyburg
J.C.S., (Nov 1960) 4603–4608

In the discussion of the title reaction, emphasis is laid on the importance of the pptn. of unstable intermediates as a factor governing the products, since in such cases the diazonium ion is removed from the influence of the water. Much controversy has centred round the mechanism by which the above unstable cpd. decompose (cf. Cowdrey and Davies, *Quart. Rev.*, **6** (1952) 370), and the treatment here is restricted to the factors which predispose the system towards unstable intermediates. A relation is found to exist between the type of behaviour displayed (phenol or phenyl halide formation, or the pptn. of diazonium salts) and the anionic radius, for which 2·2 Å appears to be a critical value. H.H.H.

Kinetics and Mechanism of Diazotisation. XVII— Kinetics of Diazotisation in Non-aqueous Solvents
H. Schmid and G. Muhr
Mh. Chem., **91** (30 Dec 1960) 1198–1199

Diazotisation of aniline in methanolic hydrochloric acid soln. at constant ionic concn. follows an analogous time law to that in aq. soln. (*Ber.*, **70** (1937) 421), viz., $\frac{d[C_6H_5N_2^+]}{dt} = k(HNO_2)[C_6H_5NH_3^+][Cl^-]$. ($HNO_2$) is not the true nitrous acid concn., since this is present mainly as methyl nitrite. Accordingly, the velocity of diazotisation in methyl alcohol is much slower than in aq. soln. and, within a certain concn. range, is proportional to the square root of the ionic concn. In carbon tetrachloride, or in an aprotic solvent, the reaction of aniline with nitrosyl chloride rapidly reaches an equilibrium, probably between the nitrosamine and the reactants. H.H.H.

Steric Effects in Di- and Tri-arylmethanes

C. C. Barker, M. H. Bride, G. Hallas, and A. Stamp

III—Electronic Absorption Spectra of Derivatives of Malachite Green containing Substituents in the Phenyl Ring

J.C.S., (Mar 1961) 1285–1290

From the spectra of Malachite Green and of its 2-, 3-, and 4-methyl-, 2,6-dimethyl-, 2- and 4-t-butyl, 2-, 3-, and 4-fluoro-, chloro-, bromo-, iodo-, nitro-, and methoxy-, 2- and 4-dihydroxy-, and 2-methyl-4-hydroxy- deriv., it appears that, with the exception of the nitro group, substituents in the 3- or 4-position have little effect on the max. intensity of the first frequency band but they modify its position to an extent which is linearly related to the appropriate Hammett substituent const. (cf. Jaffé, *Chem. Rev.*, **53** (1953) 222). Substituents in the 2-position, however, markedly increase the intensity of this band, and this increase varies directly with the van der Waals radius of the substituent except in the case of the t-butyl group; they also bring about a bathochromic shift of the first band relative to that of the 4-isomer. An equilibrium between the methyl ether of the 2-hydroxy- deriv. of Malachite Green base and its zwitterion in methanol is described.

IV—Electronic Absorption Spectra of α-Alkyl Derivatives of Michler's Hydrol Blue

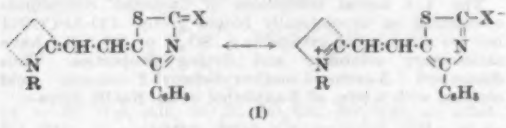
Ibid., 1395–1398

The spectra are recorded for the methyl, ethyl, n- and iso-propyl, and n-, iso-, and t-butyl deriv. of Michler's Hydrol Blue in 98% acetic acid, and also the spectra of dimeric deriv. formed during 1–4 days in this solvent. The α-methyl deriv. is unique in that in acetic acid its spectrum, which closely resembles that of the parent cpd., shows no change with time, implying that the dimer is not formed. The data are discussed in terms of mol. conformation. H.H.H.

Colour of Organic Compounds. IX—Merocyanines derived from 2-Hydroxythiazoles and Thiazole-2-thiols

E. B. Knott *J.C.S.*, (Nov 1960) 4244–4252

2-Hydroxy-4-phenylthiazole and 4-phenylthiazole-2-thiol, which contain a nucleophilic C-atom at position 5, react under basic conditions with 2-acetanilidovinyl deriv. of heterocyclic quaternary salts to give merocyanines (I; X = O or S). These are strongly polar dyes, particularly when X = S, showing hypsochromic absorption shifts with increase in solvent polarity, and, like the cyanines obtained on quaternisation, are photographic desensitisers. Similar reactions with 2-hydroxy-4-methylthiazole lead to trinuclear dyes, e.g. (II), as a result of the additional reactivity of the 4-methyl group, and their cyanine-like resonance system may be quaternised to give true cyanines. Absorption characteristics are discussed.



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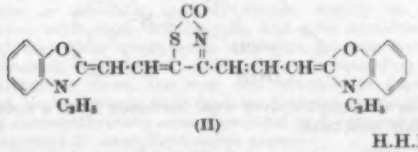


(II)

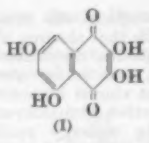
H.H.H.

Naturally Occurring Quinones. V—Spinochromes E and N

J. Smith and R. H. Thomson

J.C.S., (Mar 1961) 1008–1012

The structure (I) proposed by Kuroda *et al.* (cf. *Sci. Papers Inst. Phys. Chem. Res., Tokyo*, **53** (1959) 356) for Spinochrome N has now been confirmed by synthesis as 2,3,5,7-tetrahydroxy-1,4-naphthaquinone (I), and that of Spinochrome E shown to be 2,3,5,6,7,8-hexahydroxy-1,4-naphthaquinone (II).



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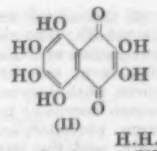


(II)

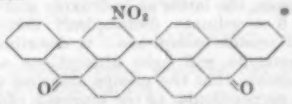
H.H.H.

Anthraquinone and Anthrone Series. XXV—Constitution of Nitrated Dibenzanthrone

S. S. Malhatra, M. K. Unni, and K. Venkataraman

J. Sci. Ind. Res. (India), **19B**, No. 10 (1960) 382–390

The constitution of the essential component of nitrated dibenzanthrone (C.I. 59850) was proved to be 16-nitro-dibenzanthrone—



and not the 3,12-dinitro- compound as accepted. Caledon Black 2BM and Cibanone Black BB (C.I. 59850) were extracted with boiling water and their hot solutions in *o*-dichlorobenzene chromatographed on Al_2O_3 at 110°C. Shading components were present in the first dye (4% tribromopyranthrone [C.I. 59710] and 5% 16,17-dimethoxydibenzanthrone [C.I. 59825]), but not in the second. The main constituents of both (by elution with *o*-dichlorobenzene and 3% phenol) were identical and were characterised by analysis and infrared absorption spectra as a mononitro compound (I), also identical with products obtained by nitration of dibenzanthrone in nitrobenzene. I on reduction and hot chromatography gave a mono-amino-, and thence a monobenzamido-dibenzanthrone. The orientation of NO_2 in (I) was shown to be either 16- or 17- by exhaustive oxidation to the unknown triquinone, 1,2,7,8-diphthaloylphenanthraquinone (II) and 2,2′-dianthraquinonyl-1,1′-dicarboxylic acid (III, known), and thence by decarboxylation to 2,2′-dianthraquinonyl (IV). II dyed cotton brown of poor fastness. Alkali fusion of equimolar amounts of benzanthrone and 2-amino-benzanthrone and chromatography of the product on Al_2O_3 at 110°C gave successively benzanthrone, 16-amino-dibenzanthrone (V), and 16,17-diaminodibenzanthrone (characterised in Part XXIV). Infrared and visible spectra in dimethylformamide of the reduction product of I and of V were identical. A.T.P.

Naphthalocyanine Analogues

V. F. Borodkin and R. P. Smirnov

Izvest. Vysshikh. Ucheb. Zavadenii, Khim. i Khim. Tekhnol., **3** (4) (1960) 718–720

Chem. Abs., **55** (20 Feb 1961) 3554

The following naphthalocyanine analogues were prepared by the method given in *Chem. Abs.*, **55** (1961) 1648, viz., 9,8,28,34-tetraaza-29,33-phenylenetribenzoisoindoline (I), 9,15,24,30 - tetraaza - 10,14,25,29 - diphenylenedibenzoiso - indoline (II), 9,16,25,31-tetraaza-26,30-phenylenedibenzo-triisoindoline (III) and 7,16,23,29-tetraaza-24,28-phenylenebenzotriisoindoline (IV). Substitution of one or two benzoisoindoline radicals in naphthalocyanine by phenyl radicals resulted in rupture of closed conjugated chain in the nucleus of tetraazaporphine and its contraction, with displacement of absorption maxima to shorter wavelengths. In analogues with one phenyl radical (I, III, IV) absorption max. are displaced towards longer wavelengths in comparison with absorption max. of the corresponding phthalocyanine analogues. The longer the benzoisoindole radicals, the more significant the displacement, attributed to accumulation of π electrons in the naphthalocyanine owing to the presence of benzoiso-indolyl radicals directly bound to the conjugation chain. II, which has two identical short and isolated conjugated chains, has absorption max. identical with that of the corresponding phthalocyanine analogue. A.T.P.

Metal Chelates

I—Micromethod for the Determination of the Valency of a Metal in a Phthalocyanine Complex

J. A. Elvidge *J.C.S.*, (Mar 1961) 869–871

In contrast to other oxidants, 0·01-N dichromate disrupts the large ring of many metal phthalocyanines and substituted tetrazaporphins without causing dehydrogenation, and titration with it thus permits the valency

state of the metal to be deduced from the observed oxygen uptake. The method confirms that the iron in iron phthalocyanine and also in the octahedral dipyridine–iron complex is in the bivalent state, but is tervalent in chloroiron phthalocyanine, and that zinc is bivalent and aluminium tervalent in their respective phthalocyanines. Platinum phthalocyanine failed to undergo oxidation smoothly, and the parent tetrazaporphin and its metal complexes consume considerably more than 1 atom-equiv. of oxygen.

II— Phthalocyanine–Chromium Complexes and Perpendicular Conjugation

J. A. Elvidge and A. B. P. Lever *Ibid.*, 1257–1265

The preparation of chromium (II) and chromium (III) phthalocyanines, the latter as hydroxide and acetate, and of several 6-co-ordinate (octahedral) deriv.— cationic, neutral, and anionic complexes— is described, and their magnetic moments and light absorptions are recorded. The data indicate that the groups attached to the metal in the plane perpendicular to the aromatic phthalocyanine system (i.e. in the fifth and the sixth co-ordination position) are conjugated to it (cf. also *Proc. Chem. Soc.*, (1959) 123, for a discussion of the feasibility of perpendicular conjugation through a metal atom). H.H.H.

Fine Structure of Absorption and Fluorescence Spectra of Certain Pigments at 77°K.

F. F. Litvin and R. I. Personov

Doklady Akad. Nauk S.S.S.R., **136** (4) (1961) 798–800

Absorption and fluorescence spectra of phthalocyanine, Mg-phthalocyanine and protoporphyrin in paraffin solutions were examined at 77°K. Spectra are characterised by a number of fine well-defined lines. Similar examination of paraffin solutions of chlorophyll failed to show any well-defined spectrum lines. This is due to the presence of certain substituents, mainly phytol, in the molecule of chlorophyll. L.S.L.

Effect of Particle Size and Pigment Volume Concentration on Hiding Power of Titanium Dioxide (C.I. Pigment White 6)

R. J. Bruehlman, L. W. Thomas, and E. Gonick

Off. Dig. Fed. Soc. Paint. Technol., **33** (Feb 1961) 252–267

The particle size of TiO_2 for max. light scattering is influenced by pigment volume concn.(PVC). Pigments of smaller particle size are required for max. light scattering power at low % PVC. The size for optimum scattering gradually increases with increasing % PVC. In tinted systems, smaller-particle-size titanias yield bluer hues. Hues become bluer also with increasing % PVC. Because of this influence of % PVC on both hiding power and hue, the optical properties of titania are best compared at the % PVC of the end application. J.W.D.

Fluorescent Brightening Agents: their Photodecomposition in Aqueous Solution and on Substrate, and Phototendering Activity for Cellulose

E. H. Daruwalla and C. I. Peter

Text. Research J., **31** (Mar 1961) 263–276

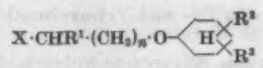
Study of the absorption characteristics and fluorescent decay of fluorescent brightening agents derived from 4,4′-diaminostilbene-2,2′-disulphonic acid and of a thiazole derivative, in aqueous solution and on cellulose, and on exposure to sunlight and in a Fade-Ometer, shows that, simultaneously with decomposition of the agents, the bursting strength of the fabric decreases, cuprammonium fluidity increases, and the reducing power of the fibres increases. The extent of degradation of the cellulose depends on the amount of agent present, and its chemical constitution, and on the type and duration of irradiation. Relation exists between the rate of decomposition of the fluorescent brightening agent and the extent of tendering, those agents which decompose most readily bringing about most tendering. Not only are the agents themselves a cause of photo-tendering of cellulose, but their photodecomposition products also cause breakdown of the cellulose chain. C.O.C.

PATENTS

Colour Couplers

Kodak *BP* 865,492 (U.S.A. 29 July 1957)

Compounds of formula—



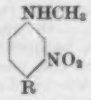
(the ring is saturated; X = group having coupling action; R^1 = H or Alk of 1–4 C; R^2 = H or n-Alk of 5–15 C; R^3 = n-Alk of 5–15 C; n = 0, 1, 2 or 3), e.g. 6-[(3-n-pentadecylcyclohexyloxy)acetamido]-2,4-dichloro - 3 - methylphenol, are colour couplers of m.p. much lower than the analogous alkylphenoxy compounds and so may be incorporated into photographic emulsions at lower temperatures, avoiding degradation of the coupler. C.O.C.

Nitro Dyes for Keratinous Fibres

Société Monsavon-l'Oreal

BP 867,220 (France 23 Apr 1959)

Compounds of formula—

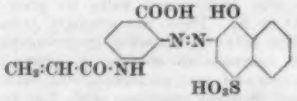


(R = amino or carboxymethylamino) are blue, violet, or pink dyes applicable to hair, etc., from aqueous solution at pH 2–9. Presence of the CH_3 group in the amino group results in much deeper dyeings being produced than with nitro-*p*-phenylenediamine. Thus white hair dyed for 20 min at 20°C in a 1% solution of 4-amino-3-nitromethylaminobenzene brought to pH 8 with ammonia, shampooed, rinsed and dried is tinted an intense reddish violet. C.O.C.

Monoazo Compounds Containing Acryloylamino Groups— Dyes for Wool, and Reactive Dyes for Cellulose

BASF *BP* 862,318 (Germany 30 Sept 1958)

Dyes similar to those of *BP* 858,183 and *BP* 858,184 (J.S.D.C., **77** (Mar 1961) 127) but containing COOH *ortho* to an azo link as well as an acryloylamino or β-chloroacryloylamino group are described. Thus the nitro group of the monoazo compound 4-nitroanthranilic acid → 1-naphthol-4-sulphonic acid is reduced by means of Na_2S to NH_2, which is then acylated by acryloyl chloride to give—

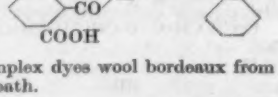


which dyes cotton red, fast to wet treatments when given an alkaline aftertreatment. E.S.

Metal-complex Monoazo Dyes for Wool, etc.

LBH *BP* 864,093 (24 Oct 1957)

The 1:1 metal complexes of monoazo compounds containing an aromatically bound group –CO·Ar·COOH but no solubilising groups (e.g. SO_3H or SO_2NH_2) have satisfactory solubility and dyeing properties. Thus diazotised 3-amino-4-methoxybenzoyl-2′-benzoic acid coupled with a soln. of β-naphthol in aq. NaOH gives—

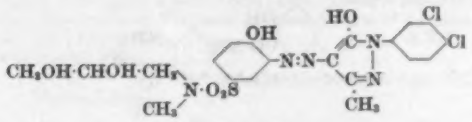


whose Co-complex dyes wool bordeaux from a neutral or weakly acid bath. E.S.

Metal(Chromium and Cobalt)-complex Monoazo Dyes for Wool, etc.

LBH *BP* 863,861 (21 Oct 1957)

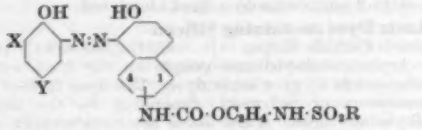
The presence of a sulphon-*N*-dihydroxypropylamide group $-SO_2\cdot N(R)CH_2\cdot CHOH\cdot CH_2OH$ (R = Alk or Ar which may contain a non-ionic substituent) in suitable 1:2 metal-complex monoazo dyes free of other solubilising groups, ensures satisfactory solubility and dyeing properties. Thus diazotised 2-aminophenol-4-sulphon-*N*-dihydroxypropyl-*N*-methylamide is coupled with 1-(3′,4′-dichlorophenyl)-3-methyl-5-pyrazolone giving



whose 1:2 Cr-complex dyes wool orange from a neutral or weakly acid bath. E.S.

Metallisable Monoazo Dyes for Wool, etc.
S *BP* 862,374 (Switzerland 31 July 1957)

Monoazo compounds—



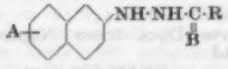
(X = H or Cl; Y = Cl, NO_2, or $SO_2{\cdot}NHC_6H_5$; R = Alk, mononuclear Ar, or $NAlk_2$; the group NH - - - - SO_3R is attached at positions 1 or 4) may be metallised with Co or Cr in substance or on the fibre or in the dyebath to give a variety of hues of good fastness on wool, nylon, etc. Thus diazotised 2-aminophenol-4-sulphonanilide is coupled in presence of $CaCO_3$ with 7-hydroxynaphthylcarbamic acid β-(dimethylaminosulphonylamino)ethyl ester to give a monoazo compound (X = H; Y = $SO_2{\cdot}NHC_6H_5$; R = $N(CH_3)_2$; the group NH - - - - SO_3R is attached in the 1-position) whose 1:2 Cr-complex dyes wool and nylon grey. E.S.

Metal-complex Monoazo Reactive Dyes for Cellulose and Cellulose Esters
FH *BP* 864,034 (Germany 7 Sept 1956)

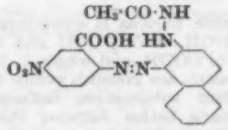
The Cr or Co complexes of *oo'*-dihydroxy-, *o*-amino-*o'*-hydroxy-, or *o*-carboxy-*o'*-hydroxy-monoazo dyes free from nuclear SO_3H groups but containing 1 or 2 groups $-SO_2{\cdot}CH_2{\cdot}CH_2{\cdot}O{\cdot}SO_3{\cdot}H$ or $-SO_2{\cdot}CH{:}CH_2$ give fast dyeings and prints when applied to cellulose and its esters and aftertreated with polyalkylene amines or their alkyl or quaternary compounds in presence of an alkali. Thus the Cr complex of the monoazo compound 2-amino-6-nitrophenol-4-(β-hydroxyethylsulphone sulphate)→β-naphthol is padded on cotton, dried, and aftertreated in a soln. containing NaCl (200 g/l.), Na_2CO_3 (100 g/l.) and a condensation product (30 g/l.) obtained by reaction of hard paraffin containing chlorine with polyethylenediamine, followed by methylation to give the quaternary ammonium salt. Boiling first in water and then in aq. soap and soda gives a grey of good fastness. E.S.

Monoazo Dyes from 2-Naphthylhydrazine Derivatives, and their Metal-complexes
BASF *BP* 863,915 (Germany 25 July 1958)

Derivatives of 2-naphthylhydrazine



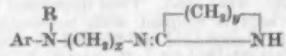
(A = H, Hal, Alk, SO_3H, SO_2Alk, $SO_2{\cdot}NH_2$ or subst. $SO_2{\cdot}NH_2$; B = O or S; R = NH_2 or subst. NH_2, or an aliphatic or aromatic radical) couple readily in the 1-position with diazo compounds, and give metallisable dyes if the diazo component contains an appropriate *o*-substituent. Compared with the corresponding β-naphthylamine dyes, the new azo compounds show a marked bathochromic shift and an increase in stability. Thus 5-nitroanthranilic acid diazotised and coupled with *N*-2-naphthyl-*N'*-acetylhydrazine gives—



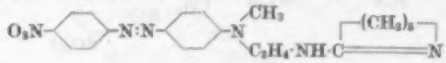
whose Ni or Co complex dyes nylon green from a neutral bath. E.S.

Monoazo Basic Dyes for Polyacrylonitrile, etc.
BASF *BP* 864,280 (Germany 21 Sept 1957)

Caprolactim-*O*-methyl ether and its homologues react with suitable aniline derivatives to give coupling components—



(Ar is of benzene series, free from SO_3H and COOH groups; R = H or Alk; x = 2 or 3, y = 3–7), which give the title dyes when coupled with diazo compounds free from SO_3H and COOH groups. Thus the monoazo compound—



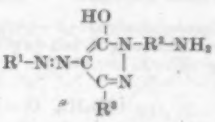
dyes polyacrylonitrile fibres yellowish red from a bath containing H_2SO_4 and Na_2SO_4. E.S.

Spirit-soluble Metal-complex Monoazo Pyrazolone Dyes
American Cyanamid Co. *USP* 2,937,165 (28 Dec 1956)

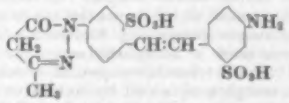
The amine salts of the metal (especially Cr) complexes of the monoazo compound anthranilic acid → 1-*p*-sulphophenyl-3-methyl-5-pyrazolone have poor solution stability in e.g. ethanol, so that precipitation occurs on standing, but admixture with 5–50% of similar compounds containing chlorine in the 2- or 2,5-positions in the phenyl residue greatly improves them in this respect. E.S.

Reactive Pyrazolone Azo Dyes for Cellulose
Ciba *BP* 863,754 (Switzerland 5 July 1956)

Cold-dyeing reactive dyes for cellulose are made by condensing 1 mol. of cyanuric chloride with 1 mol. of aminoazo compounds—



(R^1 = Ar of benzene or naphthalene series having at least one SO_3H group; R^2 = bicyclic Ar which may contain SO_3H; R^3 = CH_3 or COOH). Thus the monoazo compound obtained by coupling diazotised 5-sulphoanthranilic acid with the pyrazolone—



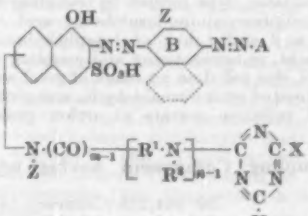
is condensed with 1 mol. of cyanuric chloride to give a yellow. E.S.

Disazo Reactive Dyes for Cellulose
Ciba *BP* 864,227 (Switzerland 3 July 1956)

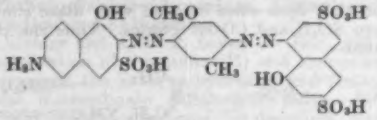
Aminomonoazo compounds containing an SO_3H group are diazotised and coupled with *p*-coupling primary benzene-series amines, and the resulting aminodisazo compounds are condensed with 1 mol. of cyanuric chloride to give the title dyes. Thus diazotised 4-aminoazobenzene-3,4'-disulphonic acid is coupled with *m*-toluidine, and the product is condensed with cyanuric chloride to give a yellowish brown. E.S.

Metal-complex Reactive Azo Dyes for Cellulose
ICI *BP* 863,758 (31 Oct 1958)

The title dyes are preferably Cu complexes of compounds—



(A = Ar with no OH *ortho* to the azo link; Z = metallisable group; the phenylene or naphthylene group B may contain further substituents; Z = H or Alk; *m* and *n* = 1 or 2, but *m* is not 2 when *n* = 1; R^1 = subst. or unsubst. phenylene; R^2 = H or Alk; X = Cl or Br; Y = Cl, Br, OAlk, Alk, Ar, NH_2 etc.). Thus diazotised *O*-*p*-toluenesulphonyl-H acid is coupled with *p*-cresidine, and the aminomonoazo compound so formed is diazotised and alkali-coupled with J acid. Removal of the *p*-toluenesulphonyl residue then gives the amino-disazo compound—



which is converted into a Cu-complex by heating with aq. ammoniacal $CuSO_4$. Condensation with 1 mol. of cyanuric chloride gives a greenish blue reactive dye.

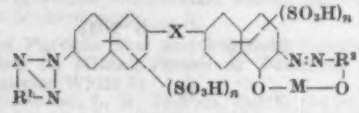
BP 864,080 (28 Nov 1958)

Similar dyes are made by using as the end-component in the formation of the azo compound a suitable amino (or subst. amino)naphtholdisulphonic acid instead of the monosulphonic J or γ acid used above. Thus the aminomonoazo compound orthanilic acid → *p*-cresidine is diazotised and alkali-coupled with 2-amino-5-naphthol-1,7-disulphonic acid, and the product converted into the Cu-complex. Condensation with 1 mol. of cyanuric chloride then gives a blue reactive dye. E.S.

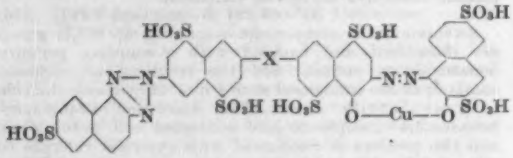
Green Metal-complex Azo Direct Dyes having a Triazole Ring

FBy *BP* 864,276 (Germany 27 July 1957)

The title dyes have formula—



(R^1 = residue of an *o*-coupling naphthylamine; R^2 = residue of *o*-coupling phenol or naphthol; M = Cr, Mn, Fe, Co, Ni, or Cu; X = azo or azoxy link; *n* = 1 or 2) and are made by combining 1 mol. of a suitable nitrotriazole with 1 mol. of a metal-complex nitroazo compound by a reducing process which forms the azo or azoxy link X. Thus the monoazo compound 6-nitro-2-naphthylamine-4,8-disulphonic acid → 2-naphthylamine-6-sulphonic acid is converted into the triazole compound, which is combined with the Cu-complex obtained by oxidative coppering of the monoazo compound 6-nitro-2-naphthylamine-4,8-disulphonic acid → R acid, by reducing with alkaline glucose, giving—



E.S.

Black Tetrakisazo Direct Dyes

Crompton & Knowles Corpn.

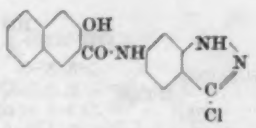
USP 2,935,507 (10 Sept 1958)

The tetrakisazo dyes formed by coupling tetrazotised 4,4′-diaminodiphenylamine-2-sulphonic acid with 1 mol. of γ or J acid and 1 mol. of 1-naphthylamine-6(or 7)-sulphonic acid, re-tetrazotising and coupling with 2 mol. of resorcinol, dye cellulose jet black of good wash fastness when aftertreated with formaldehyde, and give little or no staining of cellulose acetate or nylon present in the dyebath. E.S.

Azoic Coupling Component having an Indazole Residue

FH *BP* 864,228 (Germany 18 July 1956)

6-(2′,3′-hydroxynaphthoylamino)-3-chloroindazole—



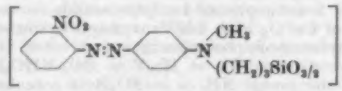
couples on the fibre with the usual azoic diazo compounds to give a range of hues from orange to black, of good fastness to solvents and to washing agents containing peroxides.

Thus cotton impregnated with a soln. of this coupling component in aq. NaOH and developed in diazotised 4-nitro-2-aminoanisole is dyed bluish red. E.S.

Azoic Dyes containing Silicon

Union Carbide Corpn. *USP* 2,934,459 (2 Aug 1957)

Arylaminoalkylsilanes couple on the fibre with diazo compounds to give azoic dyes. The dyes formed may be monomers or polymers, depending on the arylaminoalkylsilane used. Glass fibres are satisfactorily coloured in this way. Thus glass fibre boiled in a soln. in aq. methanol of *N*-(γ-triethoxysilylpropyl)-*N*-methylaniline, dried, and then immersed in a soln. of diazotised *o*-nitroaniline is dyed orange with a dye containing units of formula—

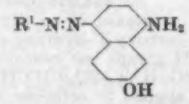


E.S.

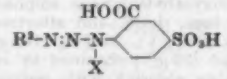
Olive, Brown, and Black Azoic Dyes

Ciba *BP* 863,216 (Switzerland 18 Oct 1956)

Mixtures of coupling components—



(R^1 = naphthalene- or benzene-series radical free from solubilising groups) with triazenes—

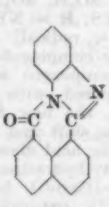


(R^2 = Ar free of solubilising groups; X = a hydrocarbon radical which may contain a solubilising group) printed or padded on cellulose fibre and steamed or heated to 130–150°C give olive, brown, or black azoic prints or dyeings. Thus a combination of the acid-coupled monoazo compound 2,5′-dichloroaniline → 1-amino-7-naphthol with the triazene derived from diazotised 2-amino-5-nitroanisole and *N*-isobutylanthranilic acid-5-sulphonic acid gives a reddish black. E.S.

Yellow Disperse Dyes from Naphthalene-1,8-Dicarboxylic Acid

FH *BP* 864,872 (Germany 20 Apr 1957)

Dyes of formula—



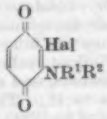
where the benzene nucleus is substituted by Hal, Alk, alkoxy, OH, COOH or OC_2H_4OH and the naphthalene nucleus by OH or COOH, and where ≥ 1 OH, COOH, or OC_2H_4OH is present, are greenish yellow to golden orange dyes of excellent sublimation fastness on polyester fibres. They have better fastness than the dyes of *FP* 1,111,620 where the benzene nucleus contains Cl, CH_3 or OCH_3. Thus, a mixture of naphthalic anhydride (19·8) and 3,4-diaminobenzene-1-carboxylic acid (16·5) is

refluxed 3 h in glacial acetic acid (150). The dye separates on cooling and dyes Terylene greenish yellow of excellent sublimation fastness. A.T.P.

1,4-Quinone Dyes

By *BP* 866,434 (Germany 5 Apr 1957)

1,4-Benzoquinones—



(R^1 = COOR; R^2 = H, COR, COOR or Alk) and where the aromatic nucleus may contain further halogen and/or NR^1R^2 groups or may have an aromatic or heterocyclic ring (which may also contain Hal and/or NR^1R^2) fused on, react with primary or secondary amines to give dyes for synthetic-polymer fibres, especially polyacrylonitrile, and for films, coatings and varnishes based on cellulose esters or cellulose nitrate. Thus, into 1-dimethylamino-3-aminopropanol (12) in ethanol (100) is stirred 2 chloro-3-amino-1,4-naphthoquinone-ethyl-*N*-carboxylate (14). The temperature rises to 40°C and the product, 2-dimethylaminopropylamino-3-amino-1,4-naphthoquinone ethyl-*N*-carboxylate separates. It dyes polyacrylonitrile dark red. A.T.P.

Acylated αα-Dihydroxydiaminoanthraquinones—Red and Violet Disperse Dyes for Polyesters

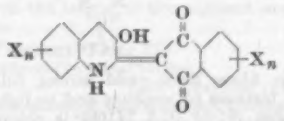
Ciba *BP* 865,809 (Switzerland 21 Dec 1956)

αα-Dihydroxydiaminoanthraquinones (I) in which each outer ring contains one of the OH groups and one of the NH_2 groups, are acylated to introduce an aliphatic monocarboxylic acid residue of < 9 C on one NH_2 group, and then (with a halide or anhydride of an aliphatic monocarboxylic acid) to introduce an aliphatic monocarboxylic acid residue or a half-ester of carbonic acid of 3–8 C on the other NH_2 group. The products are red and violet dyes of excellent light and sublimation fastness on polyester fibres, and are also suitable for other synthetic polymers. Thus, butyryl chloride (5·4) is added to 4,8-diaminoanthrarufin (13·5) in nitrobenzene (45) and dimethylaniline (13) at 35°C. The mass is heated over 1 h to 50°C and slowly to 120°C. Acetyl chloride (4) is added and after 15 min the mass is cooled to 20°C, diluted with methanol (45) and filtered to give a violet dye of excellent light and sublimation fastness on Terylene. A.T.P.

3′-Hydroxyquinophthalones—Yellow Disperse Dyes for Polyesters

BASF *BP* 865,308 (Germany 2 Aug 1958)

The dyes—

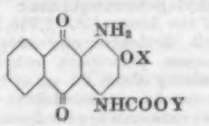


(X = Alk, alkoxy, Ar or CN, and preferably Hal; n = 0–2, at least one $n \neq 0$) are obtained by condensing substituted phthalic acids with substituted 2-methyl-3-hydroxyquinolines, or preferably by introducing the required substituent into the condensate of phthalic acid (I) and 2-methyl-3-hydroxyquinoline (II), when the mixture of products usually obtained has better affinity than the single compounds obtained by the first method. They are yellow dyes of excellent sublimation, thermofixing, ironing, and pleating fastness and very good fastness to light and wet treatment. Thus, the condensate of I and II is chlorinated to 1 atom Cl/mol. product to give a strong clear yellow of excellent fastness. A.T.P.

Carbamylanthraquinones—Red Disperse Dyes

Eastman Kodak *USP* 2,937,190 (10 Mar 1958)

Red disperse dyes of excellent fastness to light, gas fumes, washing and sublimation are—

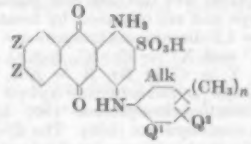


(X = CH_3, C_2H_5, $C_3H_4OCH_3$ or $C_3H_4OC_2H_5$, Y = β-alkoxyethyl, β-alkoxy-β-ethoxyethyl or tetrahydrofurfuryl). They are obtained from the requisite 1,4-diaminoanthraquinone and haloformic acid esters. Thus, 1,4-diamino-2-β-methoxyethoxyanthraquinone (1), β-methoxyethyl chloroformate (1) and ethylene glycol monomethyl ether (5) are refluxed to no further colour change, diluted with methanol (10) and filtered at 0°C to give a bright red dye (X = Y = $C_2H_4OCH_3$) of excellent light fastness on cellulose acetate and Terylene. A.T.P.

Anthraquinone Acid Wool Dyes

Gy *BP* 866,065 (Switzerland 28 Dec 1956)

Bright reddish blue dyes of excellent light and washing fastness on polypeptide fibres are—

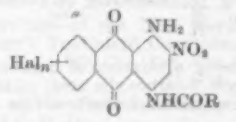


(n = 0–2; Z = H, Cl or Br; Q^1 = Alk, arylether or thioether; Q^2 = H, Alk, arylether or thioether; either Q^1 or Q^2 = arylether or thioether. Thus, 1-amino-4-bromoanthraquinone-2-sodium sulphonate (40), 3,4′,5-trimethyl-4-amino-1-phenoxybenzene (90·8), water (800), ethanol (500) and $NaHCO_3$ (20) are gently refluxed for 24 h with addition of Cu_2Cl_2 (1·2). The mass is cooled, acidified with HCl and filtered. Digestion with dil. HCl removes unchanged amine, and the dye (Z = H; Alk = Q^1 = CH_3; Q^2 = p-O·$C_6H_4CH_3$) is filtered and converted to its Na salt by dissolution in Na_2CO_3 and salting out. It dyes wool, silk and polyamides very fast reddish blue from a neutral bath. A.T.P.

1-Amino-2-Nitro-4-Acylaminoanthraquinones—Blue Disperse Dyes for Polyesters

Ciba *BP* 866,062 (Switzerland 9 Nov 1956)

The above—

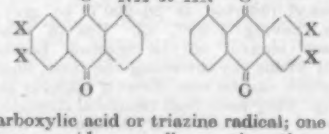


(R = Alk of 1–6 C; n = 1–2) are obtained by nitrating 1,4-bis-acylaminoanthraquinones followed by partial hydrolysis, or by complete hydrolysis and partial acylation. They are strong pure blue dyes of excellent light and sublimation fastness on polyester fibres. Of special interest are the dyes where R = propyl, butyl, isobutyl, amyl, isoamyl or hexyl and/or X = 6- and/or 7-chloro. Thus, a mixture of 1,4-diamino-2-nitro-6- and -7-chloroanthraquinone (3·17), butyryl chloride (2) and dimethylaniline (2) is refluxed 1 h in chlorobenzene (150). The mass is cooled and diluted with petroleum ether, ice-cooled, and filtered to give a fast blue dye. A.T.P.

Acylaminoanthraquinone Vat Dyes

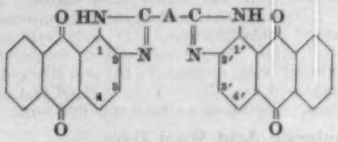
Ciba *BP* 865,816 (Switzerland 22 Mar 1957)

The above—



(R = dicarboxylic acid or triazine radical; one X of each anthraquinone residue = alkoxy, the other = H) are obtained by condensing 2 mol requisite aminoanthraquinone with 1 mol organic dicarboxylic acid derivative or cyanuric chloride. They are vat dyes of excellent fastness and their light fastness is superior to that of the isomeric dyes of *FP* 844,759 (from 2 mol 1-amino-5-alkoxyanthraquinone and 1 mol benzene dicarboxylic acid). Thus, a mixture of 1-amino-6- and -7-methoxyanthraquinone (2·9) and cyanuric chloride (1) is heated at 130°C for 14–17 h in nitrobenzene (25). On cooling, a fast yellow vat dye separates. A.T.P.

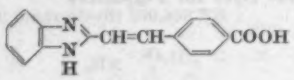
Anthraquinone Imidazole Vat Dyes
BASF *BP* 867,160 (Germany 8 Aug 1958)
The above are—



(A = optionally halogenated phenylene, especially dihalogeno *m*- or *p*-phenylene, and positions 3, 4, 3′, and 4′ may contain Cl, Br or alkoxy). They are yellow vat dyes of exceptional wet fastness and colour strength for dyes of this type and are obtained by treating 2-2·2 mol. of one or more 1,2-diaminoanthraquinones with one mol. of X^1·A·X^2 (X^1 and X^2 = HOOC, ROOC, YCO, HCHO, Y_2CH or Y_3C, Y = Cl or Br, R = Alk, Aralk or Ar). Thus, 2,5,ω,ω,ω′,ω′-hexachloro-*p*-xylene (48) and 1,2-diamino-3-bromoanthraquinone (10) are heated for 2 h at 100°C in monohydrate (100). The dye is isolated by drowning into ice and water or by diluting the mass to a concentration which deposits the dye sulphate. It dyes cotton a very fast yellow. A.T.P.

Benzimidazolylstilbene Fluorescent Brightening Agents
Sterling Drug Co. *USP* 2,937,148 (21 Apr 1955)
The fluorescent brightening agents described in *USP* 2,838,504 [= *BP* 813,543 (J.S.D.C., **55** (1959) 436)] are readily applied to textiles from aqueous dispersion, particularly in aqueous soap or detergent solutions. C.O.C.

Fluorescent Brightening Agent for Polycaprolactam
Vereinigte Glanzstoff-Fabriken *BP* 865,804 (Germany 3 Feb 1959)
The compound of formula—



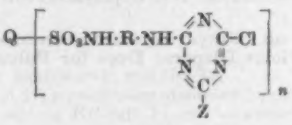
obtained by fusing a mixture of 2-methylbenzimidazole and benzaldehyde-4-carboxylic acid, yields a brightening effect on polycaprolactam which is fast to light and to washing. C.O.C.

Carboxylic Esters of Hydroxybenzimidazolylstilbene — Fluorescent Brightening Agents for Use in Detergents
Sterling Drug Co. *USP* 2,937,997 (20 June 1958)
The esters of dicarboxylic acids with the hydroxybenzimidazolylstilbenes described in *USP* 2,878,248, e.g. the bis(acid maleate) of 4-[1-(2-hydroxyethyl)benzimidazol-2-yl]-4′-{1-[2-(2-hydroxyethoxy)ethyl]benzimidazol-2-yl} stilbene, have good bluish white fluorescence, are insoluble in water and substantive to most natural and man-made fibres. They have good fastness to light and to chlorine, and are readily incorporated into soaps and detergents. C.O.C.

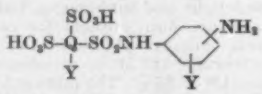
Halogenated Phthalocyanines
General Aniline *BP* 867,035 (U.S.A. 30 Aug 1956)
Phthalocyanines are chlorinated in $AlCl_3$ and SO_2 and/or thionyl chloride at 20–200°C to give the title compounds, having 1–35% Cl. Use of this medium permits easy control of the reaction because of its fluidity and yields, by drowning the melt, finely divided pigments which can be used directly without any further acid pasting. They have high tinctorial strength, fastness, and improved resistance to crystallisation from organic solvents. Thus, a stream of SO_2 is passed into $AlCl_3$ (131) until at 55–60°C the mass is liquid. The flow of SO_2 is stopped and Cu phthalocyanine (15) (C.I. 74160) (80 mesh) added. The flow of SO_2 is restricted so that the temperature rises to 100°C in 15 min and is maintained there for 30 min. The mass is then drowned into water (3000) and 37% HCl (200) and filtered to yield a product containing 4·30% Cl. Compared with a product containing 4·80% Cl prepared by known methods, it shows a darker masstone and greatly improved resistance to crystallisation. A.T.P.

Copper Phthalocyanine Tetra-sulphonic Acid Amides
Ciba *BP* 865,679 (Switzerland 18 Mar 1957)
Acetone-soluble Cu phthalocyanine dyes containing four sulphonic acid amide groups, each substituted by alkoxyalkyl (2–5 C) and in which the alkoxy residue has 1–2 C, are obtained by condensing Cu phthalocyanine tetrasulphonchloride (advantageously of high purity) with alkoxyalkylamines. They are blue dyes for resins, waxes, lacquers, plastics, cellulose ethers and esters (mass coloration of cellulose acetate) and synthetic polymers, and have excellent fastness to Cl_2. Thus Cu phthalocyanine (193) (C.I. 74160) is added to $ClSO_3H$ (1500) and the mass heated over 1 h at 70–75°C, the temperature raised to 130–135°C for 90 min and the mixture stirred at that temperature for 4 h. It is cooled to 80°C and thionyl chloride (600) run in over 1 h and after stirring at 75–80°C 1 h, poured on to ice and filtered. The product is slurried in water (300) and treated at 35–40°C with γ-methoxypropylamine (120) and $NaHCO_3$ (100) to give a product dyeing cellulose acetate in the mass a greenish blue of excellent light and washing fastness. A.T.P.

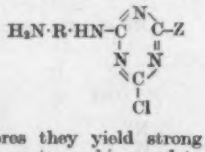
Phthalocyanine Reactive Dyes for Cellulosic Fibres
Ciba *BP* 866,513 (Switzerland 17 Aug 1956)
The above are especially—



(Q = residue of metalliferous phthalocyanine; R = alkylene or arylene; Z = subst. or unsubst. NH_2; *n* = 1–2; Q, R, and Z together contain at least two SO_3H groups). They are obtained by condensing cyanuric halides, water-soluble phthalocyanines, e.g.—



(one Y = SO_3H, the other H or SO_3H), and ammonia or an amine, so that the product contains < 1 2-halogeno-4-amino-1,3,5-triazine residue, or by condensing phthalocyanine sulphonyl halides with—



On cellulosic fibres they yield strong full dyeings of outstanding fastness to washing and to light. Thus, Cu phthalocyanine (57·5) (C.I. 74160) is chlorosulphonated with $ClSO_3H$ (537) at < 30°C for 30 min and at 130°C for 4 h to give a mixture of the trisulphonylchloride-monosulphonic acid and disulphonylchloride-disulphonic acid. This is neutralised in aqueous dispersion at 0–3°C with NaOH and treated with the secondary condensate (47·5) from 1 mol. cyanuric chloride, 1 mol. 1,3-diaminobenzene-4-sulphonic acid and 1 mol. NH_3 to give a brilliant blue reactive dye of excellent washing fastness. A.T.P.

Thermoplastic Resin Pigments
Switzer Brothers *USP* 2,938,873 (11 June 1958)
A colorant is dispersed in the condensate of an aromatic sulphonamide, a cyclic aminotriazine, and an aldehyde. The dried, coloured condensate is then ground. The products are faster to light than those prepared with the same colorants but with different condensates. C.O.C.

Insect Quinones for Dyeing Protein Fibres and Synthesis of Ethyl-*p*-benzoquinone
U.S. Secretary of the Army *USP* 2,936,210 (14 Apr 1955)
The flour beetle, *Tribolium confusum* Dur., secretes a mixture of quinones, principally ethyl-*p*-benzoquinone, each insect containing about 25 μg of the mixture. The quinone mixture can be extracted from the bodies of the insects and used in various ways for dyeing wool and nylon.

Thus, used by itself it yields a reddish brown from a neutral bath and a brown from an acid bath. Used in conjunction with an amino acid it yields e.g. with L-cysteine (free base) in a neutral bath in presence of H_2O_2 a deep reddish purple when the wool is aftertreated with ammonia and a deep blue if aftertreatment with sulphuric acid is given. Flour in which the insects have been cultivated is contaminated with the glucose mixture and an extract of the contaminated flour may also be used as a dye. The main constituent of the mixture, ethyl-*p*-benzoquinone may be synthesised by treating *o*-ethylaniline with aq. $Na_2Cr_2O_7$ in aqueous H_2SO_4 at $< 5°$ C for ≤ 18 h. The synthetic product may be used in the same way as the natural mixture; it dyes a fairly fast pink on nylon from neutral solution at 80°C. C.O.C.

Xanthophylls and other Carotenoids
F. Hoffmann-La Roche & Co.
BP 867,472 (U.S.A. 12 Nov 1958)

Fungi of the *Dacrymycetaceae* family are particularly adaptable organisms for making carotenoids by a microbiological process in which the fungus is cultured in an aqueous medium containing a source of assimilable organic N, a source of ammoniacal N, a metabolisable source of C, P and trace minerals. Culture is carried out under conditions of aeration and agitation and exposure to light. 12 Examples are given. C.O.C.

Recovery of Carbon Black (C.I. Pigment Black 6 and 7)
Sun Oil Co. *USP* 2,943,064 (17 Oct 1956)

Recovering the pigment from the effluent gases by collecting it in oil, e.g. by passing the gases through the oil or passing them countercurrent to a spray of oil, is very efficient and obviates the need for large plant and expensive equipment. C.O.C.

Oiled Carbon Black (C.I. Pigment Black 6 and 7) Pellets
Phillips Petroleum Co. *USP* 2,942,299 (27 Dec 1955)

Spraying an agitated mass of Carbon Black pellets results in pellets whose oil concentration depends on their size, the larger the pellet the greater the concentration. Separating the oiled pellets according to their size thus results in production of batches of pellets of uniform oil concentration. C.O.C.

Red Oxide of Iron (C.I. Pigment Red 101)
C. K. Williams & Co. *USP* 2,937,927 (13 Nov 1956)

When precipitating ferric oxide from an aqueous solution of a ferrous salt in presence of metallic iron and ferric oxide seed, maintenance of the pH at 3·0–4·5 throughout the oxidation reaction which forms the pigment on the seed provides complete control in successive batches both of the colour of the pigment and its purity and brightness. C.O.C.

Silica (C.I. Pigment White 27)
Columbia-Southern Chemical Corpn.
USP 2,940,830 (23 Aug 1955)

Conditions for ensuring that silica precipitated by adding acid to sodium silicate has particle size 0·015–0·040 μ and surface area 25–200 m^2/g, are described. C.O.C.

Titanium Dioxide (C.I. Pigment White 6)
British Titan Products Co. *BP* 867,479 (24 Mar 1958)

A pigment of improved fastness to light and of lower acidity is produced by treating it in gaseous suspension with an anhydrous aluminium halide to produce alumina in intimate association therewith. Titanium tetrahalide vapour is then reacted with water in presence of the treated pigment so as to produce TiO_2 in intimate association with it. C.O.C.

Composite Zinc Oxide— Zinc Titanate Pigment
Br *BP* 866,359 (24 Dec 1955)

An aqueous acidic solution of a Ti (IV) compound is treated with ZnO and the composite precipitate calcined. The proportion of the ingredients used is such that the final product contains 2–10% Ti on the weight of Zn. The product has excellent colour, hiding power, and freedom from discoloration. C.O.C.

Flaky Metal Oxide Pigments as Substitutes for Pearl Essence
DuP *USP* 2,941,895 (11 Sept 1956)

Flaky pigments imparting a nacreous or pearlescent appearance when incorporated in plastics are obtained by placing a film of a hydrolysable ester of a metal of group IVA, particularly Ti, Zr or hafnium, on a smooth surface, treating it with water vapour to hydrolyse the ester and removing the resulting polymeric metal oxide hydrolysate as transparent flakes. They can be used in stoving enamels. C.O.C.

Increasing the Pigment Content of Presscakes
Gy *USP* 2,941,896 (23 July 1958)

The pigment content of presscake is increased by 35–55% by adding to the pigment suspension a dispersing agent which is soluble in the suspension at low to moderate temperatures but which is insolubilised and precipitated at high temperatures. Examples are a methyl cellulose or methyl starch which is soluble in water at $< 50°$C but gels at higher temperatures and becomes insoluble at $> 64°$C. C.O.C.

Tetrafluoro-1,4-benzoquinone (III p. 320)
Developments in Dyes and Dyeing (VIII p. 334)
Dyeing Polyacrylonitrile Fibres and Basic Dyes therefor (VIII p. 336)
Self-coupling Azoic Components for Terylene (VIII p. 337)
Solutions containing Bixin (C.I. Natural Orange 4) for Dyeing Citrus Fruits Yellow to Orange (VIII p. 337)
mm'-Dioxydiphenols as Coupling Components in Diazotype Intermediates of High Opacity (IX p. 338)
Quinones. III— *o*-Semiquinones and their Use as Sensitive Reagents for Calcium (XIV p. 342)
Anthraquinone and Anthrone Series. XXIV— High-temperature Chromatography of Vat Dyes (XIV p. 342)
Conjugated Macrocycles. XXXII— Absorption Spectra of Tetrazaporphins and Phthalocyanines. Formation of Pyridine Salts (XIV p. 342)

V— PAINTS; ENAMELS; INKS

Review of Activities of the New York Society for Paint Technology's Technical Committee
S. B. Levinson *Off. Dig. Fed. Soc. Paint Technol.*, 33 (Feb 1961) 300–305

Tint Retention of Weathered Exterior Latex Paints
G. M. Kagan and E. B. Hunt
Off. Dig. Fed. Soc. Paint Technol., 33 (Mar 1961) 380–389

Comparison of the tint retention of latex paints based on a styrene–butadiene copolymer (I), a polyvinyl acetate copolymer (II), and an acrylate polymer; II gave the best performance, I the poorest. There is significant variation in performance amongst latices based on equivalent polymer compositions, and other substances such as emulsifiers and protective colloids are believed to play an important role. A study of the pigment volume concn. of paint films based on these latices over wood and cement–asbestos substrates is included. J.W.D.

Function of Extender Pigments in Exterior Vinyl Emulsion Paints
F. P. Liberti *Off. Dig. Fed. Soc. Paint Technol.*, 33 (Mar 1961) 390–407

Performance of polyvinyl acetate emulsion paints over both wood and cement surfaces is evaluated as a function of binder, extender pigments (of seven types), pigment vol. concn., and substrate, with special reference to the effect of the extender. Most commonly used types of extender are suitable for use in such paints, though some variation in durability was observed. J.W.D.

Retention of Solvents in Lacquer Films
R. E. Murdock and J. A. Carney
Off. Dig. Fed. Soc. Paint Technol., 33 (Feb 1961) 181–198

Solvents retained in lacquer films may be quant. analysed by adaptations of gas-chromatographic techniques. The effects of vehicle composition, solvent types, film dimensions, ambient and elevated temp. exposures, and other treatment variables are considered; film solvent retention and film hardness are correlated, taking these variables into account. J.W.D.

Emissivity and Reflectivity of Coatings
Los Angeles Society for Paint Technology
Off. Dig. Fed. Soc. Paint Technol., **33** (Feb 1961) 283–299

A discussion of the composition of coatings in relation to their ability to control the amount of radiant energy they absorb or emit. Methods of measurement are described. J.W.D.

Water-dispersed Industrial Coatings
N. S. Estrada *Off. Dig. Fed. Soc. Paint Technol.*, **33** (Mar 1961) 417–436

Discussion of the formulation and evaluation of metal primers and enamels based on water-dispersed vehicles (including polyvinyl acetate, alkyds, and water-soluble melamine–formaldehyde resins), for curing at both ambient and elevated temp. Industrial wood finishes of these types are discussed. J.W.D.

Isano Oil
L. Cummings *Off. Dig. Fed. Soc. Paint Technol.*, **33** (Mar 1961) 408–416

Isano oil, a newly available vegetable oil of African origin, polymerises at low temp. and may be used to produce chemically resistant coatings; it can be incorporated in a wide range of water-based paints. At high temp. coatings based on isano oil blister through the evolution of gases released by decomposition; they are thus valuable as intumescent fire-retardant paints. J.W.D.

PATENTS

Fluorescent Printing Ink
American Cyanamid Co. *USP* 2,940,937 (29 Apr 1954)

A fluorescent ink suitable for high-speed printing consists of a resinous material of pigment particle size, an organic fluorescent dye and the vehicle. The resinous material is formed by mixing a resin-forming monomer with an aqueous dispersion of a thermoplastic polymer, preferably a vinyl chloride–vinylidene chloride copolymer or polyacrylonitrile, of pigment particle size, and then polymerising the mixture. Thus methylol urea (18) in water (300) was added to aqueous dispersion (800) containing polyacrylonitrile (20) of particle size 0·16 μ and the temperature raised to 80°C. Conc. HCl (5) was then added, the mixture brought to 90°C, and allowed to cool. The resulting white pigment was separated, washed and dried at 50°C. To a solution of Teglac resin 127 (1) and diethylene glycol (1) were added Rhodamine B (C.I. Basic Violet 10) (0·005), Rhodamine 6G (C.I. Basic Red 1) (0·005) and the above white pigment (1) and the mixture was milled. C.O.C.

Inks for Recording Instruments
Record Electrical Co. *BP* 865,965 (10 Sept 1956)

A filtered solution of a basic dye in pure ethylene glycol does not evaporate from its container, does not precipitate solid matter to choke fine-bore pens, has constant life over a wide temperature range, does not mildew, and dries normally on paper to yield transparent markings so that reference lines on charts are visible through them. C.O.C.

Solutions for producing Fast-to-light Coatings, Lacquers and Adhesives
FBy *BP* 866,857 (Germany 10 May 1958)

Solutions consisting of 3-(α-isocyanatoethyl)-phenyl isocyanate, a polyhydroxy compound, e.g. trimethylol propane, an inert organic solvent and if necessary an isocyanate-reaction accelerator, e.g. Zn octoate, yield coatings which have excellent fastness to light and to weathering. C.O.C.

Tinting Compositions for Paints, etc.
Benjamin Moore & Co. *USP* 2,942,997 (24 Mar 1958)

A pigment is ground or dispersed in a base liquor which itself is dispersible and compatible in all types of vehicles used for paints, etc., e.g. a mixture of *p*-nonyl phenol ether of poly(7½ moles)ethylene glycol (insoluble in ethylene glycol), *p*-nonyl phenol ether of poly(12 moles)-ethylene glycol (soluble in ethylene glycol), lead chromate (C.I. Pigment Yellow 34), calcium carbonate (C.I. Pigment White 18), ammonium oleate, mineral spirits (b.p. 307–340°F) and acetone. C.O.C.

Non-burnishing Flat Paint
Johns-Manville Corpn. *USP* 2,941,891 (17 June 1957)

Paint having a 60° specular gloss of < 10, yields a film which does not become glossy when rubbed, is obtained by mixing into a conventional flat paint a substantial amount (35–60% on wt. of pigments) of relatively coarse, irregular, fragmentary mineral particles, e.g. dry ground whiting of approximate size classification: 7% on 100 mesh, 35% on 200 mesh, and remainder on 325 mesh. C.O.C.

Metallised Coating Compositions
American-Marietta Co. *USP* 2,941,894 (16 Mar 1955)

Coatings yielded by a film-forming composition and metal mirror plate particles of thickness 3×10^{-6}–25×10^{-6} in e.g. aluminium flake (C.I. Pigment Metal 1), have lustre, brilliance, and depth hitherto unobtainable. C.O.C.

Flaky Metal Oxide Pigments as Substitutes for Pearl Essence (IV p. 329)
Printing on to Varnished or Non-varnished Surfaces (IX p. 337)
Acrylic Esters in Copolymer Latices (XIII p. 341)
Alkyd Copolymers for Solvent Coating Systems (XIII p. 341)
Measurement of Gloss (XIV p. 343)
Ultraviolet Accelerated Testing Method for Gloss Retention of Paints (XIV p. 343)

VI—FIBRES; YARNS; FABRICS

Production of Electron-microscopic Pores in Surface Layer of Fibres—I
Y. Matsunaga and M. Kato
J. Soc. Textile Cellulose Ind. Japan, **17** (Feb 1961) 144–149

Fibres are principally high polymers, but also contain some low polymers (e.g. dimers, trimers, tetramers). Effects of heat treatment at low pressure on polyamides, polyesters, and wool have been examined, and it has been found that these fibres, on heating to 80–200°C at a pressure of 10^{-2} to 10^{-3} mm Hg, give off low polymers in addition to absorbed gases. Nylon 6 and Tetoron have been evacuated by rotary pump for 1 h at 100°C and 135°C, respectively, and the sublimates collected and examined by microscope. Fibres treated in this way, and untreated fibres, have been dyed under identical conditions, and the fibre cross-sections examined microscopically. The treated fibres are reported to be much better dyed. This is considered to be due to the production of "electron-microscopic" pores in the surface layer of these fibres by the evacuation treatment discussed above. I.G.L.

Effect of Weathering on Properties of Textile Fibres—V
J. Lünenschloss and H. Kurth
Textil Praxis, **16** (Jan 1961) 51–56

Having investigated the effect of natural and artificial weathering in relation to the composite denier of the yarn, the authors found that 360 hours' exposure in a test apparatus is approximately equivalent to one year's weathering under natural conditions. Longitudinal and cross sections of various fibres (polyamide, polyester, polyacrylonitrile, polyethylene, polypropylene), before and after weathering, are shown in 34 photomicrographs. L.A.T.

Effect of Light on Cotton and other Cellulosic Fabrics
H. M. Robinson and W. A. Reeves
Amer. Dyestuff Rep., **50** (9 Jan 1961) 1–13

A comprehensive review of work reported between 1948 and 1958 covering theoretical aspects of the photodegradation of (undyed) cellulose, methods of test, the effect of light on dyed and finished cellulose and the prevention of photodegradation. 131 References. A.J.

Studies on Cyanoethylated Viscose Rayon
M. Yajima and I. Inoue
I—Cyanoethylated Cellulose Xanthate
J. Soc. Textile Cellulose Ind. Japan., **17** (Mar 1961) 253–258

In searching for a viscose rayon suitable for resin-finishing, a modified cellulose fibre was prepared by treating cellulose xanthate with acrylonitrile, followed by the normal spinning process. The reaction of cellulose xanthate with acrylonitrile has been investigated, and the properties of the rayon so obtained compared with those of normal and amine-treated viscose. It is concluded

that—(1) The rate of cyanoethylation of xanthate increases with decrease in the DP of the alkali-cellulose. Optimum temperature and reaction time for cyanoethylation are 20°C and 20 min. (2) Cyanoethylated viscose has a lower rate of ripening than normal viscose, contains less sulphur as a by-product, and has a higher γ-value. Its viscosity is lower than that of normal viscose with a ripening time of up to 50 h, but above this the order is reversed. (3) The solubility of the cellulose increases on treatment with acrylonitrile, whereas it decreases on treatment with amine.

II—Fine Structure of Cyanoethylated Cellulose Fibre and Reactivity of this Fibre to Melamine Resin

Ibid., 259–262

The chemical nature and fine structure of the cyanoethylated cellulose fibre, and the effects of melamine resin finishing have been studied. It is concluded that—(1) Nitrogen is present in the cyanoethylated fibre in the form of –CN and $-CONH_2$ groups in the side chains of the cellulose, whereas this is not so with amine-modified rayon. (2) Cyanoethylated fibre and amine-modified rayon have both lower crystallinity, shorter crystallite length, and higher moisture regain than normal viscose. (3) The suitability for finishing with melamine-resin decreases in the order cyanoethylated fibre > amine-modified rayon > normal viscose rayon. I.G.L.

Studies on Fibrous Acetylation of Cotton. III—Some Properties of Acetylated Cotton

W. Tsuji, R. Kitamaru, and M. Imai

J. Soc. Textile Cellulose Ind. Japan, **17** (Mar 1961) 235–242

Various properties of acetylated cotton prepared by methods reported previously (J.S.D.C., **77** (Apr 1961) 181) have been studied. These include tensile properties, moisture and water absorption, specific gravity, microscopic structure, thermal and electrical properties, abrasion resistance, weathering properties, resistance to acid, inflammability, dyeability, shrinkage by water boiling, soiling and soil removal. I.G.L.

Vapour-phase Acetylation of Cellulose. VIII—Influence of Solvents on Sorption of Perchloric Acid on Cellulose in Acetic Acid–Solvent Mixtures

I. Kido, K. Suzuki, and S. Nishimori

J. Soc. Textile Cellulose Ind. Japan, **17** (Feb 1961) 132–138

Acetylation catalysts are sorbed by cellulose in acetic acid or acetic anhydride solution, and this is of importance for pretreatment or acetylation of cellulose. Influence of solvents mixed with acetic acid or acetic anhydride on the sorption of perchloric acid, electrical conductivity, and rate of acetylation has been studied, and the mechanism considered. Solvents can be divided into two classes—(1) Hydrocarbons, and derivatives containing Cl, OH (e.g. cresol), NO_2 (e.g. nitrobenzene). They do not react with perchloric acid, and their presence results in lower conductivity, increased sorption, and higher rate of acetylation. (2) Derivatives containing –O–, CO and CN groups. They combine with perchloric acid by hydrogen bonding, and cause a decrease in the sorption of perchloric acid and rate of acetylation. I.G.L.

Study of Cellulose Acetate. II—High-temperature Acetylation with Acetic Anhydride and Sulphuric Acid

S. Takahashi *J. Soc. Textile Cellulose Ind. Japan*, **17** (Feb 1961) 125–128

Purified cotton linters pre-soaked in acetic acid were acetylated at 70 and 90°C with minimum amounts of acetic anhydride and sulphuric acid. Average DPs of triesters obtained were 115–180 at 70°C and 105–120 at 90°C. Acetylations were carried out using 250 or 300% of acetic anhydride based on the weight of the cellulose. Rate of reaction depends more on amount of sulphuric acid than on that of acetic anhydride. Minimum amount of acetic anhydride is reported to be 4 moles per glucose anhydride unit, being almost the theoretical requirement. The rate of acetylation increases with sulphuric acid concentration and with temperature. The triesters were obtained at 70°C using 0·7 and 0·5% sulphuric acid (based on the weight of cellulose) for 90 and 120 min, respectively. Minimum amount of sulphuric acid necessary for production of triesters is 0·5% at 70°C and 0·2% at 90°C. I.G.L.

Polarisation of the Ultraviolet Luminescence of Wool Keratin

S. V. Konev and M. A. Katibnikov

Doklady Akad. Nauk S.S.S.R., **136** (2) (1961) 472–475

Photoelectric measurements of polarisation spectra of luminescence in region 320–380 mμ were used to study energy transfer in a protein molecule containing tryptophan. Wool keratin was selected as the most suitable, mainly because of its ability to fluoresce and also to undergo $\alpha \rightarrow \beta$ transformation. Water and water/glycerol solutions of free tryptophan show a high degree of polarisation (27%) whereas wool examined under similar conditions shows considerably smaller polarisation (2–7%). The reduced polarisability is explained by energy transfer along the disorientated tryptophan residues. Wool stretched to twice its original length in water vapour and oriented parallel to the direction of incident light shows strong polarisation effect. This is explained on the basis of a change from α to β configuration, where oriented pseudocrystalline sections of amino acids are formed. This structural change occurs gradually and is reversible. L.S.L.

Development of Wool Fibre Crimp on Drying

T. D. Brown and W. J. Onions

J. Textile Inst., **52** (Mar 1961) T101–T108

Changes in curvature or crimp caused by changes in the moisture content of segmented wool fibres are shown mathematically to depend on changes in length in cortical cells, the diameter of the fibre, the relative proportions of the ortho- and para-sections and, to a smaller extent, the ratio of their extension moduli. Experimental evidence provides support for this theory. This change on drying is an important contribution to the apparent crimp of wool fibres. W.R.M.

Measure of Work of Elastic Deformation of Wool Fibre Bundles

J. Millet and S. Deli

Bull. Inst. Text. Erance, (92) (Jan–Feb 1961) 19–34

The work required to extend wet fibre bundles by 20–30% was measured by means of a Cambridge extensometer. The test can be used to follow changes in the viscoelastic behaviour of wool during processing. J.C.F.

New Reactions in Reduced Wool Fibres

A. Schöberl *J. Textile Inst.*, **51** (Dec 1960) T613–T627

The SH groups in reduced wool react readily with vinyl sulphone. An analytical method was developed for the extent of reduction in wool and this may be used to detect SH bonds formed by the action of KCN or NaOH on wool. Divinyl sulphone leads to extensive network formation in the peptide chains of the wool fibre. Dimethyl maleate and *N*-*p*-phenetyl maleinimide also react rapidly with reduced wool, replacing the labile ·S·S· bonds by stable thioether bonds. Reduced wool has been treated with thiosulphinic acid esters, producing unsymmetrically substituted ·S·S· bonds, and cyclic thiosulphinic acid esters lead to network formation in the fibre. Unsymmetrical disulphides and bis-disulphides may be detected in the hydrolysates of treated wool. Reduced wool reacts with mono- and di-functional Bunte salts (salts of esters of thiosulphuric acid) to produce unsymmetrically substituted ·S·S· bridges, and bis-disulphide bridges arise with polymethylene dithiosulphates which can produce a network structure in the fibre. P.G.M.

Acrylonitrile-stabilised Wool Keratin Derivatives. II—Development of a Reproducible Preparation from Cortical Cell Residues

J. J. Bartulovich, Y. Tomimatsu, and W. H. Ward

J. Textile Inst., **51** (Dec 1960) T628–T636

Treatment of cold reduced solutions of cortical cell residues (obtained by acid digestion of wool) with acrylonitrile under nitrogen yields reasonably reproducible preparations of mol. wt. 30,000 on dialysis. They consist of 15–20% of the original wool or 20–30% of isolated cortical-cell residues, and are lower in sulphur and in amino-N content than the original wool or cortical-cell residues. The product of mol. wt. 30,000 is provisionally related to the α-keratose fraction of oxidised wool, or corresponding kerateine fractions, by hydrolytic fission of,

on the average, not more than two peptide bonds per chain. The low mol.-wt., high-sulphur fraction that is lost by dialysis or failure to precipitate is related to the γ-keratose fraction. P.G.M.

Chemical Modification of Wool

I— Cyanoethylation

M. Oku and H. Ishibashi

J. Textile Inst., **51** (Dec 1960) T637–T642

Wool has been cyanoethylated with both liquid and gaseous acrylonitrile. The gaseous process gives a greater degree of cyanoethylation than the liquid process, reaching a maximum of ca. 6·0 g-equiv. acrylonitrile/10^4g wool. Preformalised wool shows a lower degree of cyanoethylation than untreated wool. When wool is treated with acrylonitrile in the gaseous phase, using KCN as catalyst, shrink-resistance is increased. Breaking strength increases and alkali-solubility remains unchanged, but there is no marked change in respect to mothproofness. The effect on dyeing properties of the introduction of cyanoethyl groups into wool keratin is discussed.

II— Benzylation

M. Oku and H. Ishibashi *Ibid.*, T642–T646

Wool was treated with benzyl chloride, triethanolamine (as catalyst) and a small amount of carrier. The carriers tested were methanol, ethanol, n-propanol, n-butanol and n-octanol, all in the anhydrous state. The degree of benzylation decreases in the order in which the carriers are given. Maximum benzylation (ca. 13 g-equiv./10^4 g wool) is attained in methanol, and minimum benzylation (approx. 0·6 g-equiv./10^4 g wool) in n-octanol. The products of benzylation show increases in alkali-solubility, breaking strength and elongation, and supercontraction by phenol and by sodium bisulphite, and show decreases in hygroscopicity.

III— Formalisation of Stretched Wool

M. Oku, G. Kajimoto, and H. Ishibashi

Ibid., T646–T650

Treatment of wool with formaldehyde or hexamethylenetetramine after stretching by 30 or 60% in water at 28 or 80°C was studied. Degree of formalisation is higher at 60% stretch than at 30% and, for a given stretch, higher at 80°C than at 28°C. The cystine content of wool decreases on formalisation to an extent that is proportional to the degree of formalisation and to the amount of stretching. Wool set in steam before formalisation shows a variable decrease in degree of formalisation, while the cystine content of set fibres decreases slightly less than that of unset fibres on formalisation. P.G.M.

pH Values of Aqueous Extracts of Raw Wool

G. Wibaux, G. Mazingue, and M. van Overbèke

Bull. Inst. Text. France, (92) (Jan–Feb 1961) 7–18

pH of aqueous extract, ash content, and alkalinity of ash were determined on 54 lots of raw wool from various countries of origin. There was a highly significant correlation between pH of aqueous extract and alkalinity of ash, and a tendency for wools from a particular country to fall within a definite range of alkalinity. This information should be considered when determining alkali requirements in scouring. Lanthionine content, urea–bisulphite and alkali solubility, and fineness were determined on selected wools after degreasing and washing in water at 40°C. Correlation was found between lanthionine content and pH of raw wool, between urea–bisulphite solubility and pH of raw wool, and between lanthionine content and urea–bisulphite solubility. Locks showing yellowing at the tips were found to have a higher lanthionine content in this region. A significant correlation was also found between alkali solubility and fineness of the washed wool samples. Such a correlation has previously been reported for scoured and combed wool samples (*Idem*, *Ibid.*, 1960 (87) 61; J.S.D.C., **76** (Oct 1960) 605). J.C.F.

Oxidative Degradation of Protein Chains of Wool

H. P. Lundgren

J. Textile Inst., **51** (Dec 1960) T806–T816

As an index to the resistance of wool samples to oxidative degradation, the time required to break samples of standardised dimensions immersed in sodium hypochlorite solution in a specially designed apparatus has been adopted. Early work by Goldschmidt indicated that the terminal amino groups of protein chains are a primary site of attack by hypohalite, and it is found that treatment with isocyanates, which blocks amino groups, increases the resistance of wool to degradation by hypochlorite. Irradiation damage to wool is similar in some respects to hypohalite degradation. Wool irradiated with electrons shows a decreased resistance to hypochlorite attack: treatment of wool with tetramethyl thiuram disulphide (I) has a marked protecting effect against irradiation damage. Model experiments with amino acids and peptides indicate that treatment with I results in the formation of a dehydrothiohydantoin ring at the N-terminus, a reaction which involves the same oxidative removal of H atoms from ·NH·CHR· groups which occurs in the Strecker degradation of amino acids by hypohalites. A related finding is the enhanced stability of polydimethylglycine to ultraviolet radiation and hypochlorite, compared with polyglycine. Resistance to hypochlorite attack is reduced if wool fibres are impregnated with clay particles or carbon black. This effect, which is considered to be physical in origin, may have application to problems of soiling. J.C.F.

Oxidative Insolubilisation of Proteins

C. Earland, J. G. P. Stell, and A. Wiseman

J. Textile Inst., **51** (Dec 1960) T817–T827

Silk, wool, α-keratose, casein, and insulin are strongly coloured by chlorine dioxide and potassium nitrosodisulphonate, and in general become less soluble. From the hydrolysates of the oxidised proteins a black material could be isolated which exhibited typical properties of melanin. Tyrosine and polytyrosine also gave dark products when treated with the same reagents. It is suggested that this oxidative insolubilisation of proteins is due to the formation of cross-links, with a melanin-like structure, between two tyrosine residues in different chains. Insulin was found to be insolubilised by treatment with peracetic acid, although no colour develops in this case, and the formation of melanin-like cross-links is questionable. J.C.F.

Preparation and Properties of Wool Proteins

J. M. Gillespie, I. J. O'Donnell, E. O. P. Thompson, and E. F. Woods *J. Textile Inst.*, **51** (Dec 1960) T703–T716

Methods available for breaking disulphide bonds in wool are reviewed. Subsequent fractionation procedures give fractions which have sulphur contents respectively greater and less than that of wool. The amino-acid compositions of the high- and low-sulphur fractions show characteristic similarities whatever the method of preparation. The low-sulphur fractions aggregate extensively in solution, and even in the presence of dissociating agents, e.g. urea and sodium dodecyl sulphate, a minimum mol. wt. of approx. 50,000 is found. No relation is found between optical rotation in solution and the state of aggregation, and chemical methods of end-group determination give inconclusive results. Tryptic digestion of the low-sulphur fraction has given a complex mixture which cannot be fractionated to give individual peptides. It is concluded that a reproducible and homogeneous protein component has not yet been isolated from wool. J.C.F.

Degradation of Cystine in Ethylamine Solution

R. L. Elliott, R. S. Asquith, and M. A. Hobson

J. Textile Inst., **51** (Dec 1960) T692–T702

The reactions occurring when cystine, alone or in the presence of cysteine, is boiled in ethylamine have been investigated. On the basis of the results, it is suggested that one mode of decomposition of cystine by alkalis involves the reduction of cystine by the H_2S formed by the decomposition of traces of cysteine. The detailed scheme presented explains the formation of thiol, H_2S, and free sulphur, as well as lanthionine, serine, and alanine. J.C.F.

Action of Tetrakis(hydroxymethyl)phosphonium Chloride on Wool and Hair

L. S. Bajpai, C. S. Whewell, and J. M. Woodhouse

J.S.D.C., **77** (May 1961) 193–197

Reactivity of *N*-Mercaptomethylpolyhexamethyleneadipamide Disulphide compared with that of Wool Keratin

C. Earland and D. J. Raven

J. Textile Inst., **51** (Dec 1960) T678–T691

An investigation of the reactivity of *N*-mercaptomethylpolyhexamethyleneadipamide disulphide (I), which contains ·CH_2·S·S·CH_2· cross-linkages, towards reagents

which react with the disulphide linkages of keratin. Reaction of I with oxidising agents follows one of two courses. Either (*a*) all the sulphur is eliminated as H_2SO_4, or (*b*) half the sulphur is converted to combined $-SO_3H$ groups, and the remaining half is eliminated as H_2SO_4. For I oxidised with peracetic acid according to (*b*), the sulphonic acid sulphur, as determined by ion exchange, differed from the total sulphur by an amount exactly equivalent to the number of free amino groups present. This inhibition by amino groups of the release of protons from $-SO_3H$ groups would explain the lack of ion-exchange properties shown by oxidised wool. With acidic $KMnO_4$, or alkaline hypochlorite, irrespective of the severity of treatment, approx. 70% of the disulphide linkages of I remained intact, and it is considered that the similar behaviour of these reagents towards keratin, which has been cited as evidence for the presence of cystine residues of varying reactivity, is simply a consequence of the non-specific character of the oxidising agent. Reaction of I with KCN gives, quantitatively, a thio-ether analogous to lanthionine. The postulated mechanism for lanthionine formation in wool, involving α-aminoacrylic acid residues, cannot occur in the case of I, and it is considered that this mechanism is probably incorrect. J.C.F.

Solubility of Wool in Urea–Bisulphite Solutions and its Use as a Measure of Fibre Modification—II
K. Lees, R. V. Peryman, and F. F. Elsworth
J. Textile Inst., **51** (Dec 1960) T717–T725

Results are given which show the effect of dyeing, setting, dry heat, and exposure to light on the urea–bisulphite solubility of wool. The effect of alkaline treatment has been further examined and related to changes in lanthionine sulphur content and in rate of dyeing. P.G.M.

Relationship between Cross-linking in Lincoln Wool and Urea–Bisulphite Solubility, Swelling Ratio, and Young's Modulus
J. C. Atkinson and P. T. Speakman
J. Textile Inst., **51** (Dec 1960) T726–T739

Wool can be cross-linked by mild alkaline treatment at moderate temperatures, and the degree of cross-linking can be consistently estimated from the change in urea–bisulphite solubility or from the cystine lost by the wool during the alkali treatment. The swelling ratios and Young's moduli of alkali-treated and oxidised fibres can be fitted satisfactorily into theoretical equations connecting these properties with the degree of cross-linking of the fibres. P.G.M.

The Role of SH Groups in Wool
H. Zahn, F.-W. Kunitz, and D. Hildebrand
J. Textile Inst., **51** (Dec 1960) T740–T755

The effect of an alkaline treatment on the cystine, lanthionine, and sulphur contents, and on urea–bisulphite solubility, was examined with normal wool and with wool treated with *N*-ethylmaleinimide. Wool was also treated with KCN, Na_2SO_3, $NaHSO_3$ and $HS{\cdot}CH_2{\cdot}COOH$ at different temperatures. During the treatment of wool with alkali or reducing agents lanthionine is formed, the rate of formation being decreased if part of the combined cysteine groups is blocked by *N*-ethylmaleinimide. There is a direct correlation between the SH content of wool and lanthionine formation. A new mechanism of lanthionine formation in wool is proposed by a direct ($S_{N}2$) reaction between RS and the carbon atom in the ·C·SS bond of combined cystine or the ·C·SX bond in cysteine derivatives. Lanthionine formation is assumed to be a simultaneous side-reaction of disulphide-exchange reactions. P.G.M.

Characterisation of Cortical Structures of Keratin Fibres by Urea–Bisulphite Solubility
J. H. Dusenbury
J. Textile Inst., **51** (Dec 1960) T756–T774

Urea–bisulphite solubility has been examined to determine its utility for characterising the cortical structures of keratin fibres. Low solubility (15%) is shown by human hair, considered to be a para fibre; intermediate values (45–55%) are given by crimped apparel wool fibres considered to be ortho-para with bilateral asymmetry; and high values (75%) by kid mohair, considered to be chiefly ortho. Prior heating of a crimped apparel wool decreases its urea–bisulphite solubility; the effect is not reversed by a mild wetting-out treatment. Storage of urea–bisulphite solutions at 21°C resulted in marked losses of reducing power, the kinetics of the decomposition being zero order with respect to stoichiometric sulphite. M.T.

Determination of Alkali Solubility of Silk—Application to Silk damaged by Micro-organisms
P. Rochas and S. Pierret
Bull. Inst. Text. France, (92) (Jan–Feb 1961) 101–105

Moderate microbiological damage to silk results in a diminution in tensile strength and elongation at break, but no change in alkali solubility or fluidity, suggesting that the damage is extremely localised. The authors summarise the effect of various types of damage on the tensile properties, alkali solubility, and fluidity of silk. J.C.F.

Studies on Rabbit Fibres
S. Ikeda

XL—Relation between Felt Density and Physical Characteristics of Fur in Carrotted Bulks
J. Soc. Textile Cellulose Ind. Japan, 17 (Feb 1961) 100–105

Felt density has been related to mechanical and frictional properties and to crimp. The resilience is lowered as the felt density is increased, and as the concentration of $NaNO_2$ in the carrotting solution is increased. M.T.

XLI—Relation between Carrotting and Felting
Ibid., (Mar 1961) 226–234

It has been reported from a study of shrinkage of wool tops that the shrinkage is greater the greater the resilience R_s. This is in contradiction to the results obtained on carrotted fur (see preceding abstract). The explanation given is that in modified fur, in which the cystine link is unbroken, the larger the relative work of elongation (E_r) the larger is R_s, whereas when the cystine link is broken, as in carrotted fur, the greater E_r the smaller is the resilience R_s. It is concluded that the physical property more directly related to feltability is the relative work of elongation rather than the resilience. I.G.L.

Chemical Action of Carrotting Agents on Fur
H. G. Fröhlich
J. Textile Inst., **51** (Dec 1960) T1237–T1245

The primary chemical reaction in carrotting is the breaking of cystine linkages, by either oxidation or reduction, and 20–30% of accessible cystine bonds must be broken for effective felting to be possible. In addition, an N→O peptidyl shift takes place, as in carbonising of wool. Rupture of peptide, salt or hydrogen bonds without cystine bond rupture does not affect the felting power of rabbit hair. Carrotting also causes an increase in swelling, a reduction in the force needed to extend the fibre, and a considerable increase in the frictional resistance of the fibre surface. M.T.

Melting Equilibrium for Collagen Fibres under Stress: Elasticity in the Amorphous State
P. J. Flory and O. K. Spurr
J. Amer. Chem. Soc., **83** (20 Mar 1961) 1308–1316

The relationship between tensile force f and melting temp. for rat-tail tendon collagen, cross-linked with *p*-benzoquinone, was investigated in pure water, and in 1-M and 3-M KCNS soln. Latent changes in length, ΔL, for the transformation, were established as a function of stress and temperature through investigations of stress–strain–temperature relationship for amorphous collagen in the same media. Heats of transformation, ΔH, under these conditions were found by the use of $[\partial(f/T)/\partial(1/T)]_{p,eq} = \Delta H/\Delta L$. Heats of fusion obtained from ΔH by correcting for integral heats of dilution associated with swelling of amorphous collagen were 1·35, 1·0 and 0·45 kcal. mole^{-1} of peptide unit in respective media. The corresponding entropy of fusion accords with values found for melting of other polymers. Above melting temp. the stress for amorphous cross-linked collagen, maintained at fixed elongation is approx. ∝ absolute temp. Stress is therefore predominantly entropic in origin and elasticity is rubber-like. F.J.

Polyamide Fibres—Characterisation by Infrared Spectroscopy
P. Bouriot
Bull. Inst. Text. France, (92) (Jan–Feb 1961) 93–99

The infrared spectra of the polyamide fibres nylon 6.6, Perlon L (nylon 6), Enant (nylon 7), Rilsan (nylon 11),

and Urylon (nonamethylene polyurea) show definite differences in the region 1500–850 cm^{-1}. Between 3500 and 1500 cm^{-1}, the spectra of the first four polymers closely resemble one another, indicating that the state of association through hydrogen bonds is similar. J.C.F.

Effects of Iron Oxalate Adsorbed by Nylon
T. Hikota *J. Soc. Textile Cellulose Ind. Japan*, **17** (Feb 1961) 190–192

When rust adheres to a fibre owing to an error in processing, it can be easily removed by immersing the fibre in dilute oxalic acid. With nylon, however, the ferrous and ferric oxalates produced are readsorbed by the fibre, giving rise to discoloration, degradation, and brittleness on exposure to sunlight. The higher the temperature of the oxalic acid treatment, the longer the duration of the immersion, and the nearer the pH of the solution is to 7, the greater is the extent of adsorption of the iron salts. Langmuir's absorption isotherm fits the results. I.G.L.

Polymerisation of Methacrylic Acid in Irradiated Nylon 6.6 Fibres
A. R. Mathieson J.S.D.C., **77** (May 1961) 208–209

Microscopical Observations on Nylon 6 Filaments undergoing Photodegradation
K. Kato *J. Soc. Textile Cellulose Ind. Japan*, **17** (Feb 1961) 139–143

The Procion Black HGS procedure, developed originally for differentiation of the skin–core effect in viscose rayons (see J.S.D.C., **75** (1959) 631; **76** (1960) 64; **77** (Mar 1961) 133), has been found to give a characteristic staining on cross-sections of nylon 6 filament irradiated in the Fade-Ometer. A comparative study with other microscopical staining methods has indicated that photodegradation of nylon 6 filaments takes place in a heterogeneous manner, and that it is essentially an oxidation reaction caused by photoactivated oxygen which results in the formation and accumulation of certain relatively stable aldehydic intermediates. Electron microscopy shows that nylon 6 filaments that have undergone a long period of irradiation in the Fade-Ometer possess a marked microfibrillar structure. The photo-oxidative degradation is therefore considered to take place preferentially in the interfibrillar regions. I.G.L.

Prevention of Pilling in Fabrics Made from Cotton and Polyester Fibres
F. Bürkle *Textil Praxis*, **16** (Jan 1961) 39–40

The tendency to pilling is reduced if the filament denier and staple length of the polyester component are chosen to match the particular quality of cotton used in the blend. High twist values, tight weaves, and suitable aftertreatments, e.g. singeing, help to eliminate pilling. L.A.T.

PATENTS

Dispersing Pigments in a Solution of an Acrylonitrile Polymer
Chemstrand Corpn. *USP* 2,941,970 (8 June 1955)

Uniform dispersion is obtained by mixing an aqueous dispersion of a pigment with a miscible solvent and removing water until it is $< 3\%$ of the mixture, which is then added to a solution of an acrylonitrile polymer. C.O.C.

Dyeable Polypropylene-based Polymeric Products
Montecatini Societa Generale per l'Industria Mineraria e Chimica *BP* 866,920 (Italy 27 Sept 1956)

Mixing 1–20% of an uncured epoxy resin with a linear, unbranched, head-to-tail crystalline polypropylene yields a product which when extruded or moulded yields a product having the same mechanical characteristics as polypropylene and markedly improved surface characteristics, e.g. whiteness and appearance, and affinity for disperse dyes. C.O.C.

Optical Rotatory Dispersion of Dyes Bound to Macromolecules—Dye–Polyglutamic Acid Complexes (IV p. 321)
Symposium—Dyeing and Finishing of New Cellulosic Fibres (VIII p. 335)
Application of Descaling Technique to Theory of Shrink-proofing of Wool (X p. 339)
Electron Microscopy—Recent Applications to Crystallinity and Morphology of Synthetic and Natural Polymers (XIII p. 341)

VII—DESIZING; SCOURING; CARBONISING; BLEACHING

Response of Cottons to Chemical Treatments. II—Yarn Mercerisation
L. Rebenfeld *Text. Research J.*, **31** (Mar 1961) 253–257

When eleven different cottons were yarn-mercerised under constant-length conditions, they responded differently. Some of these differences are related to fibre structure, particularly fibrillar orientation as estimated by X-ray angle. Because of the complex structural features of spun yarns, these experiments further emphasise the great caution that must be used when extrapolating information gained from single-fibre experiments to yarns and presumably also to fabrics. C.O.C.

Comparison of Hydrocelluloses from Unmercerised and Mercerised Cotton Cellulose
R. L. Colbran and G. F. Davidson
J. Textile Inst., **52** (Mar 1961) T140–T152

For a given series of hydrocelluloses the loss in weight following treatment for 6 h at 100°C with 0·25-N sodium hydroxide or strontium hydroxide is approximately linearly related to the initial copper number, but the loss with either alkali is less for a hydrocellulose from mercerised cotton than for one of the same copper number from unmercerised cotton. With hydrocellulose of either type, strontium hydroxide causes a considerably smaller loss of weight than sodium hydroxide. Treatment of a hydrocellulose with alkali under the specified conditions gives an undissolved residue with a much lower copper number and a much higher carboxyl content than the original hydrocellulose, but the fall in copper number and rise in carboxyl content with either alkali are greater for a hydrocellulose from mercerised cotton than for a hydrocellulose of the same copper number from unmercerised. The fall in copper number and rise in carboxyl content are greater with strontium hydroxide than with sodium hydroxide. A hydrocellulose from mercerised cotton has a higher cuprammonium fluidity than one of the same copper number from unmercerised. The theoretical interpretation of these results is discussed. W.R.M.

Effect of Laundering Methods on the Creasing of "Wash-and-Wear" Cotton Shirts
M. B. Shilling and R. W. Padgett
Amer. Dyestuff Rep., **50** (6 Feb 1961) 85–91

A detailed investigation of "wash-and-wear" cotton shirts has largely confirmed previous work on the effect of washing conditions on fabric creasing. W.G.C.

PATENTS

Vapour Treatment of a Moving Web—Bleaching Paper with Hydrogen Peroxide Vapour
DuP *USP* 2,939,760 (26 Oct 1955)

Apparatus in which a stream of H_2O_2 vapour is caused to flow parallel to and in contact with a moving web of moist paper and at the same speed. The atmosphere is kept as far as possible to contain only H_2O_2 vapour. This results in very rapid absorption of H_2O_2 so that only a very small section of the paper need be exposed to the vapour at any given moment. C.O.C.

1,3-Dichloro-5,5-dimethylhydantoin as Bleaching Agent
Wyandotte Chemicals Corpn.
USP 2,938,764 (25 Feb 1957)

The effectiveness of 1,3-dichloro-5,5-dimethylhydantoin as a bleaching agent is much increased if it is used in aqueous solution at pH 12–14. C.O.C.

VIII—DYEING

Developments in Dyes and Dyeing
R. W. Henley *Dyer*, **125** (10 Mar 1961) 349–353

A review of progress 1960–61. *Wool*: Peters–Stevens solvent-dyeing technique applied to screen-printing, and continuous dyeing of slubbing and fabric. Different solvents investigated; quick strike with benzyl alcohol requires improved machine circulation for level results. Formic acid shows less strength loss than sulphuric or acetic acids in ordinary dyeing at boil. Successful dyeing "in situ" by oxidation or azoic coupling. *Cellulosic Fibres*: High-temperature sulphur, vat or direct dyeing on cotton sliver covers dead fibres, retains wax. Phthalocyanine Panduran dyes are not phototropic on resin-treated

fabrics. Fastness of diazotised and developed dyeings is improved. Heat-setting of cotton–triacetate blends reserves triacetate in vat dyeing. *Nylon*: Stable print pastes avoid "haloing". Fluorescent brightening agent is added to the polymer. Capron is dyed in pale, medium depths from continuous padding, infrared setting and dyeing process. *Polyesters*: Esterophile dyes, yellows, red and blue, applied at 110–130°C are very bright, fast to light and to sublimation. Solvent dyeing gives greater depth at the boil than aqueous dispersion at 250°F under pressure. *Acrylic Fibres*: Improved one-bath methods of dyeing Orlon–Dacron and Orlon–Arnel blends. Cationic dyes with varying exhaustions are applied levelly to Orlon blends. *Dyeing Methods*: High-temperature automatic beam dyeing; Pad–roll; "Copa", electronic control of cake-dyeing; glass fibres; carriers assist all fibres. 40 References.

R.A.P.

Symposium—Dyeing and Finishing of New Cellulosic Fibres

I—Dyeing and Finishing Zantrel Polynosic Staple Fibre

C. E. Coke

Amer. Dyestuff Rep., **50** (9 Jan 1961) P17–P22

Zantrel is a new cellulosic fibre produced by a modified viscose process, having an average DP of 520 and possessing a fibrillar structure. A review is given of its physical properties and dyeing behaviour, which are intermediate between those of mercerised cotton and those of conventional rayons.

II—Dyeing and Finishing Enka Fibre 500

L. R. Graybeal *Ibid.*, P22–P23

Enka Fibre 500 is a regenerated cellulose fibre of high wet modulus and low elongation. Its mechanical properties are similar to those of cotton, as is its behaviour to crease-resist finishing. The dyeing behaviour is similar to that of conventional rayon.

III—Introduction to the Dyeing and Finishing of Corval, Topel, and Moynel

R. S. Kenyon *Ibid.*, P23–P25

Corval and Topel are regenerated cellulose fibres cross-linked with methylene ether linkages. They may be dyed as ordinary Fibro, but because water imbibition is only 50% of that of Fibro longer dyeing times and higher salt concentrations are sometimes needed. Dimensional stability is good and very little resin is needed. Moynel is a high-wet-modulus fibre, having normal dyeing properties. It can be successfully mercerised with 6–8% NaOH soln.

IV—Avron, Avril, and Avlin—Three New Fibres from Avisco

I. H. Welch *Ibid.*, P25–P27

Avril is a high-wet-modulus cellulosic fibre. Its processing requires no special conditions and the fibre can be mercerised. Avron is a high-tenacity rayon of high elongation. It has high abrasion resistance. Avlin is a multicellular fibre which, when wetted and dried, will bond firmly to itself or other cellulosic fibres. This produces a firm, crisp handle. In addition the fibre has a broad, flat cross-section and thin walls which permit close contact between fibres and the intertwining of Avlin fibres with others in a blend.

A.J.

Dyeing Behaviour of Celliton and Celliton Fast Dyes in Dyeing of Secondary Acetate and Triacetate

S. Hafenrichter *Textil Praxis*, **16** (Mar 1961) 273–278

Dyeing behaviour is shown by curves of temperature–dye uptake and dye concentration–dye uptake. The method of preparation and interpretation of these curves is then given. Following are two tables showing selected values from such curves for the above dyes on secondary acetate and triacetate. A further table shows the effect of dyeing auxiliaries on the depth and tone of the dyeings.

P.B.S.

Foam, Flow, and Level Dyeing—Factors influencing Flow of Dye Liquor through Wool Packages

H. R. Hadfield and D. R. Lemin

J.S.D.C., **77** (May 1961) 198–205

Effect of Ultraviolet Radiation on Dyeing Properties of Worsted Fabric

G. L. Stott J.S.D.C., **77** (May 1961) 206–208

Dyeing Blends of Wool and Man-made Fibres

J. A. Leddy *Canadian Textile J.*, **78** (17 Feb 1961) 41–50

Dyeing of blends of wool with the polyester fibres, Dacrons 54 and 64, Terylene, Kodel and Vycron, the acrylic fibres Orlon and Acrilan 16, and the modified acrylic fibre Zefran, at atmospheric pressure, is discussed. For polyester fibres the carrier *o*-hydroxydiphenyl is preferred for Dacron, Terylene, and Vycron, but butyl benzoate is better for Kodel. One- and two-bath methods are compared, selections of disperse and acid dyes for each are given, and a one-bath method which employs an *o*-hydroxydiphenyl carrier is detailed. The affinity of Dacron 64 for cationic dyes enables brighter colours of greater fastness to wet and heat treatments to be achieved economically, but dyeings on this fibre do not have as high light fastness as on acrylic fibres. Dyeing of Dacron 64–wool blends with basic and acid dyes, using a one-bath method and a carrier, is described. Wool–acrylic fibre blends are dyed preferably with basic and acid dyes because disperse dyes stain the wool too heavily. In the one-bath I-T method the basic dye is complexed with an anionic agent and the complex is dispersed with a non-ionic agent to assist the dyeing of the acrylic fibre while the wool is dyed with acid dyes. A list of suitable dyes is given. Dyeing of Zefran–wool blends depends upon the correct partition of acid dyes between the fibres. This is governed by dyebath pH, depth of dyeing and choice of dye, the last being limited by the low light fastness of some suitable dyes on Zefran. Dyes are listed according to their partition properties. Wet fastness may be improved by an aftertreatment with tannic acid and tartar emetic.

W.P.M.

Recent Developments in Dyeing and Finishing of Hosiery Yarns and Knitwear

H. W. Partridge *Dyer*, **125** (10 Mar 1961) 360–364

Large quantities of bulked, crimped, and textured yarns (and particularly high-bulk acrylic yarn) are dyed in hank form in "Hussong-type" machines with extra, lower set of adjustable stainless-steel sticks which avoid yarn distortion. Other machine improvements: "four-square" weir (4 gallons per lb per min flow); self-sealing pressurised lid; closed heating coils; automatic flow reversal; temperature control and recording. Disperse dyes give good levelling on acrylic yarn, basic dyes require careful temperature and pH control, and/or use of organic retarding agents. Fluorescent dyes, tinting colours with sequestering agents give satisfactory whites. Improved auxiliaries allow use of faster acid and premetallised dyes on wool yarn. There are improved package-dyeing machines and re-circulatory air dryers, for cheeses, cones and cakes. A cellulose sponge core permits package dyeing of high-bulk acrylic yarn. Garments knitted from tri- and multi-lobal nylon yarns "absorb" moisture. There is increased beam dyeing of warp-knitted fabrics, advantages over winch being: no creasing, wider widths, bigger loads, low liquor ratios. Polyester and polyamide fabrics must be set before beam dyeing. Perforated drum dryers avoid tension and pressure marks, and maintain handle. Schreiner finish is given to warp-knitted lingerie. Radiant heat setting is described. Automatic dye-boarder machines are discussed.

R.A.P.

Dyeing of Acrylonitrile Fibre

V—Decomposition of Monoazo Acid Dyes on Application of the Cuprous-ion Technique

Y. Takase *J. Soc. Textile Cellulose Ind. Japan*, **17** (Feb 1961) 162–167

The dyeing of acrylonitrile with monoazo acid dyes by the cuprous-ion technique is discussed. When hydroxylamine sulphate is used as reducing agent for the production of cuprous ions, dyeing is accompanied by reductive decomposition of the dye with production of aromatic amines. Factors influencing the reduction of the dye have been investigated. At the boil the formation of aromatic amines is a third-order reaction. The rate and order of reaction depend on temperature, and at 80 and 90°C the reaction is second order. The number and position of sulphonic acid groups in the dye are of importance, the rate constant increasing with increase in the number of such groups. The concentration of the hydroxylamine is also reported to influence the decomposition. However, pH, if $< 5{\cdot}0$, has relatively little effect.

VI—Effects of Surface-active Agents on Absorption of Acid Dyes

Y. Takase and Y. Kojima *Ibid.*, 167–171

The retarding influence of surface-active agents on application of acid dyes by the cuprous-ion technique is discussed. Retarding effect of anionic agents depends on the concentration of agent. Although, with non-ionic agents, a concentration of $< 1\%$ on the weight of the fibre promotes absorption of dye, at concentrations of 2·5 and 5·0% there is a retarding effect, and it is considered that reaction between auxiliary agent and dye takes place. In each case the surface-active agent reacts with the positively charged fibre resulting from the co-ordination of the cuprous ions with the cyano groups. The dyeing properties are similar to those of wool toward acid dyes. The results are interpreted in terms of modern theories of diffusion in fibres. I.G.L.

Dyeing of Acrilan 16 and Acrilan 16/Acrilan 1656 Blends

W. Stump *Amer. Dyestuff Rep.*, **50** (6 Feb 1961) 105–107

Regular Acrilan (Acrilan 1656) is dyed with a variety of dye classes, whilst Acrilan 16 is dyed with disperse and cationic dyes only. The procedures for dyeing these fibres separately and in blends with one another and with other fibres are explained. W.G.C.

Dyeing Synthetic Fibres with Remazol Dyes

W. Hacker *Textil Praxis*, **16** (Mar 1961) 269–272

Dye is warmed in an alkaline (trisodium phosphate) bath to produce the reactive form, then acidified, the fibre is introduced and the bath heated. For nylon 6.6 and Perlon, acetic or formic acid and a temperature of 100°C are used; Rilsan requires a temperature of 120°C. For basified polyacrylonitrile fibres (Acrilan, Creslan, and Leacril) the method is similar to that for polyamide fibres. But here the fabric must first be thoroughly washed, dyed in the presence of sulphuric acid at 100°C, allowed to cool slowly, then neutralised in a fresh bath to remove the sulphuric acid. P.B.S.

Dyeability of Vinylon. III—Unusual Dyeing Behaviour of Vinylon

A. Nasuno and K. Tanabe

J. Soc. Textile Cellulose Ind. Japan, **17** (Mar 1961) 263–272

Further experiments on the unusual dyeing behaviour of vinylon reported previously have been carried out. On dyeing with the direct dye, Congo Red, viscose rayon exhibits a well-defined equilibrium, and the equilibrium value decreases with increase in the temperature of dyeing. With vinylon, however, no such distinct dyeing equilibrium is observed, and the approximate equilibrium value increases with dyeing temperature. On the other hand, the behaviour of vinylon on dyeing with a disperse dye, Diacelliton Fast Brilliant Blue BF, is similar to that of cellulose acetate. A distinct equilibrium is observed, the equilibrium value decreasing as dyeing temperature increases. The explanation given is that the acetyl groups, which are responsible for the affinity for disperse dyes, are situated in the amorphous regions in the fibre and so are always accessible to the dye. The hydroxyl groups are situated in both amorphous and crystalline regions, and so the number of groups accessible to the direct dye will vary according to the dyeing conditions. I.G.L.

Spectroscopy in the Visible Region of Vinylon and Cotton dyed with Direct Dyes

K. Fujimo and F. Fujimoto

I—Relationship between Wavelength of Maximum Absorption and Amount of Dye Sorbed by the Fibre

J. Soc. Textile Cellulose Ind. Japan, **17** (Feb 1961) 172–178

A study of the state of the dye molecule in the dyed fibre, i.e. whether (*a*) the dye is sorbed monomolecularly or (*b*) dye molecules associate in the fibre. For vinylon and cotton it is observed that—(1) If there is only one absorption band in the reflection spectrum of the dyed fabric, then the wavelength of maximum absorption shifts to shorter wavelengths as the amount of dye sorbed by the fibre increases. (2) If there are two absorption bands, the intensity of the band of shorter wavelength is stronger than that of the longer wavelength band at low concentrations of sorbed dye. This situation is reversed as the concentration of sorbed dye increases.

II—Relation between K/S and the Amount of Sorbed Dye

Ibid., 178–180

The Kubelka–Munk equation gives the same relation for the dyed fabric as does Lambert–Beer's Law for the dye solution. The relation between extinction coefficient at a particular wavelength and the concentration of the dye is linear only for dilute solutions, and non-linear for concentrated solutions owing to association of the dye molecules; similarly, the relation between the concentration of dye in the fibre (D_f) and the coefficient of the Kubelka–Munk equation (K/S) is linear only for low dye concentrations. With identical concentrations of dye in the fibre, the value of K/S for dyed vinylon is, for all dyes, lower than that of dyed cotton. When the same amount of dye has been sorbed by both fibres, cotton is dyed deeper than vinylon. The state of the dye molecule in the fibre is considered to exert considerable influence on the colour of the dyed fibre.

III—Colour of Dyed Fabric expressed by means of CIE Colour System

Ibid., 180–182

The colour of the dyed fabric has been expressed on the CIE system. (1) Locus on chromaticity diagram—as the amount of sorbed dye increases, the locus on the chromaticity diagram does not give a linear relationship through the light source. (2) The value of the luminosity of dyed vinylon is always higher than that of dyed cotton at the same dye concentration in the fibre. (3) Most of the dyes used gave a clearer colour on cotton than on vinylon, particularly at greater depths. I.G.L.

PATENTS

Diazotisation in Presence of Developer

American Cyanamid Co. *USP* 2,938,762 (15 Nov 1955)

Diazotisation of an amine on the fibre can be accomplished in absence of mineral acid and coupling effected simultaneously if a developer and acetic acid are present in the solution and if the bath is at < 125°F. Thus cellulose acetate or nylon is treated with an aqueous solution of a diazo base, rinsed and then immersed in a second bath containing nitrite, acetic acid, and 2-hydroxy-3-naphthoic acid (C.I. Developer 8). C.O.C.

Colouring Cellulose Acetate and Nylon with Metallised Unsulphonated Azo and Azomethin Dyes

BrC *BP* 859,409 (26 July 1956)

Metallised unsulphonated azo and azomethin dyes yield dyeings and prints of excellent fastness to light and to washing on cellulose acetate and on nylon if they are applied in presence of an organic swelling agent. C.O.C.

Dyeing Nitrogenous Fibrous Material with Sulphonated Copper Phthalocyanine

Ciba *BP* 860,908 (Switzerland 6 Aug 1958)

Dyeing is carried out in an acid bath containing an assistant which has at least one basic N atom linked to at least one radical containing a polyglycol ether chain. The assistant also contains at least three $\rangle$C-C-O-, preferably $-CH_2CH_2-O-$, groups and > 3 C not belonging to these groups, e.g. an oleylamine–ethylene oxide condensate. After the required amount of dye has been taken up, the pH of the bath is raised to > 6. The method is particularly useful for obtaining solid dyeings of good wet fastness on wool–nylon blends. C.O.C.

Modified Cuprous-ion Method of Dyeing Polyacrylonitrile Fibres

American Cyanamid Co. *USP* 2,939,759 (14 Sept 1953)

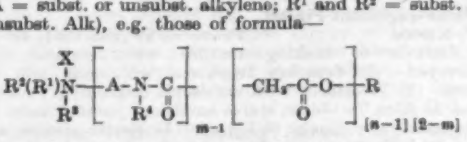
Deep level dyeings are obtained if the cuprous copper is present as its complex with an organic complexing agent containing at least one cyano group, e.g. cyanoguanidine. In addition, oxidation and too rapid exhaustion of the cuprous ion are avoided, no large excess of reducing agent is necessary, and ordinary acid and direct dyes are not adversely affected. C.O.C.

Dyeing Polyacrylonitrile Fibres and Basic Dyes therefor

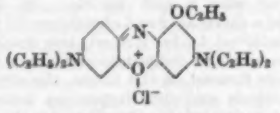
Ciba *BP* 866,335 (Switzerland 31 July 1956)

Level dyeing of polyacrylonitrile fibres is obtained by applying basic dyes free from SO_3H groups in presence of monoquaternary ammonium salts containing at least one

aralkyl or cycloalkyl radical or a group $-N\cdot A\cdot \overset{+}{N}(R^1)R^3$ (A = subst. or unsubst. alkylene; R^1 and R^2 = subst. or unsubst. Alk), e.g. those of formula—



(R = aliphatic hydrocarbon radical of > 8 C; R^1 and R^2 = Alk or hydroxyalkyl; R^3 = subst. or unsubst. aliphatic, cycloaliphatic or araliphatic radical; R^4 = H, Alk or hydroxyalkyl; A = low mol. wt. alkylene; m and n = 1–2; where m = 1, R^3 is aralkyl or cycloalkyl). Thus, from a dyebath containing 4% acetic acid (40%) and 0·5% dimethylbenzyl-laurylammonium chloride and 0·5% of the dye—



polyacrylonitrile is coloured a strong blue of good level quality. A.T.P.

Conditioning Polyester Textiles for Dyeing and Imparting Anti-pilling Properties

Martin Processing Co. *USP* 2,938,811 (9 Nov 1959)

Heating in a hot liquid medium at a very high temperature is used to improve dyeing and anti-pilling properties. Thus clean dry polyester cloth is passed through diethylene glycol at 360–365°F for 10 s, excess glycol squeezed off and the cloth passed through cold water. The treated cloth dyes deeper with disperse dyes (in absence of a carrier) and with cationic dyes than does the untreated cloth. C.O.C.

Self-coupling Azoic Components for Terylene

FH *BP* 863,329 (Germany 25 June 1957)

Products like those of *BP* 666,462 (*J.S.D.C.*, **68** (1952) 195), arylides of suitable *o*-hydroxycarboxylic acids or of acylacetic acids, containing an NH_2 group, are treated on Terylene with nitrous acid to give azoic yellows, reds, and blues of good fastness to sublimation. Or an NO_2 group may be present which is reduced in the dyebath to NH_2 before diazotisation and coupling. Thus to a solution in aq. NaOH of 3-hydroxy-2-naphtho-*m*-nitroanilide is added sodium hydrosulphite; suitable carriers are then added and the reduction product is applied to Terylene at the boil. Treatment at 85°C in aq. HNO_2 then develops the bright red azoic dye. E.S.

Solutions containing Bixin (C.I. Natural Orange 4) for Dyeing Citrus Fruits Yellow to Orange

H. J. Keller *USP* 2,943,943 (10 July 1957)

Satisfactory aqueous emulsions of Bixin for dyeing citrus fruits are obtained by using as emulsifier a mixture of oleic acid with not less than an equal amount of an amine, e.g. Bixin (2 g), dipentene (20 ml), oleic acid (5 ml), amine (5 ml), and water (100 ml), the first four components are heated to 220°F and then the water added to produce the emulsion. The pH must be kept at 7–13 if full colour value on the fruit is to be obtained. C.O.C.

Nitro Dyes for Keratinous Fibres (IV p. 324)
Insect Quinones for Dyeing Protein Fibres and Synthesis of Ethyl-*p*-benzoquinone (IV p. 328)
Production of Electron-microscopic Pores in Surface Layer of Fibres— I (VI p. 330)
Colouring Cellulose Triacetate Fibres (IX this page)
Imparting Crease-recovery Properties, Dimensional Stabilisation and Increased Affinity for Dyes to Cellulosic Fabrics (X p. 339)
Shade Control for Military Textiles used by the U.S. Army Quartermaster Corps (XIV p. 343)

IX— PRINTING

PATENTS

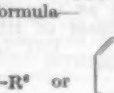
Printing with Ester Salts of Leuco Vat Dyes

General Aniline *USP* 2,940,813 (4 Dec 1953)

Presence of an imidazole or benzimidazole much increases the solubility in water of ester salts of leuco vat dyes even in presence of electrolytes.

USP 2,940,814 (4 Dec 1953)

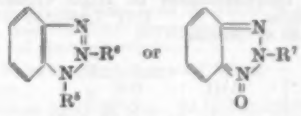
Pyrimidines of formula—



(R^1 and R^3 = NH_2, H, OH or CH_3; R^2 = CH_3 or C_2H_5; R^4 = NH_2, H, OH, CH_3, C_2H_5 or oxo), e.g. pyrimidine and 2-hydroxy-4-aminopyrimidine, have the same solubilising action.

USP 2,940,815 (4 Dec 1953)

Benzotriazoles of formula—



(R^5 = H, Alk, OH, hydroxyphenyl or acetyl; R^6 = H, Alk or carboxymethyl; R^7 = Ar of the benzene series), e.g. benzotriazole and 2-phenyl benzotriazole-1-oxide, can be similarly used. C.O.C.

Colouring Cellulose Triacetate Fibres

BrC *BP* 859,685 (28 Mar 1956)

Cellulose triacetate textiles are readily coloured by applying a colorant in conjunction with aqueous diethylene glycol diacetate. Thus a printing paste consists of methyl cellulose, NH_4 thiocyanate, diethylene glycol diacetate, water and dye, and a bath for jig dyeing consists of water, dispersing agent, and the disperse dye 2-nitrophenylamino-4-sulphonbutylamide. C.O.C.

Printing on to Varnished or Non-varnished Surfaces

H. E. H. Raskin *BP* 866,625 (Belgium 21 Feb 1958)

An ink made up of a dye together with a binder and a carrier, both of which are fatty substances, is used, e.g. oleic acid (20 g), colorant (25), mineral oil (760), heavy grease (160), methyl-glycol (15). Varnished surfaces are rendered receptive to the ink by heat and/or by passing through an atmosphere containing solvent vapour. The ink in such cases must also contain a "mordant" chosen in accordance with the varnish on the surface. Finally the printed surface is cleansed free of the carrier. C.O.C.

Coating by Electrodeposition

Commonwealth of Australia *BP* 866,780 (Australia 14 June 1956)

The particles of the coating material, e.g. paint, resins, dyes or pigments, are coated with an agent which maintains in them a selective surface charge when they are dispersed in an electrically insulating medium. The material to be coated is placed between electrodes in such a dispersion. The electrodes develop an electrostatic field in the dispersion and so cause the particles of paint or the like to deposit themselves very uniformly on to the material being coated. Examples of the use of the process in producing recording tapes, coloured paper or foil, coated leather or cloth, printing rollers or patterns, are given. C.O.C.

Multilayer Reversal Colour Material

Eastman Kodak Co. *USP* 2,937,086 (26 July 1955)

A multilayer material developed by the solvent-transfer process but not requiring barrier layers or interlayers is obtained by incorporating in the emulsion layers a non-diffusing coupler capable of reacting with the oxidation products of primary aromatic amine developers, a nucleating agent for precipitating dissolved silver salts, and a non-diffusing reducing agent or acceptor for oxidised developer, e.g. 2-[α-(4′-t-amylphenoxy)-n-butyrylamino]-5-methyl-1-phenol, colloidal silver and 2,5-di-s-octyl hydroquinone. C.O.C.

Colour-reaction Type Duplicating

Eastman Kodak Co *USP* 2,936,707 (22 June 1951)

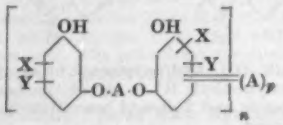
A master sheet printed with a composition containing a nickel salt is contacted with copy sheets moistened with rubeanic acid (dithio-oxamide) dissolved in a solvent for the nickel salt. This yields high-intensity black copies without discolouring the copy paper. C.O.C.

Planographic Dye Transfer Process
Eastman Kodak Co. *USP* 2,940,849 (10 July 1957)

A silver halide emulsion layer is exposed to light and then developed with a solution containing a primary aromatic amino developer and an ionic coupler, e.g. a sulphonated pyrazolone colour coupler. This yields an ionic dye image which is then dyed up with a diffusable ionic dye of charge opposite to that of the dye image. The colloid layer containing the dye image is then placed in contact with an element containing a mordant for the ionic dye, and transfer of the ionic dye is made by imbibition methods. Repeated transfers can be similarly made merely by recharging the ionic dye image with the ionic dye. C.O.C.

***mm'*-Dioxydiphenols as Coupling Components in Diazotype Intermediates of High Opacity**
General Aniline *USP* 2,940,852 (19 Feb 1957)

Compounds of formula—



(A = alkylene; X and Y = H, Alk, sulpho, Hal; p = 0 or a whole number; n = 1 when p = 0 and p + 1 when p > 0), e.g. *mm'*-ethylenedioxydiphenol, used for the above purpose have satisfactory visual and high actinic opacity and no objectionable smell. C.O.C.

Azide-sensitised Resin Photographic Resist
Eastman Kodak Co. *USP* 2,940,853 (21 Aug 1958)

Photomechanical images, e.g. stencils, are produced by using organic-solvent-soluble colloid materials, e.g. natural and synthetic rubbers, sensitised with organic-solvent-soluble arylazides, e.g. 4,4'-diazidochalcone, and after exposure removing the unexposed parts by treatment with an organic solvent. C.O.C.

Heat-sensitive Copy Sheet
Sperry Rand Corpn. *USP* 2,940,866 (10 Apr 1957)

The heat-sensitive layer consists of a colourless carbinol base derived from a triphenylmethane or styryl dye, an acid former and a film former, e.g. Crystal Violet (C.I. 42555) carbinol base, benzamide, and polyvinyl alcohol. C.O.C.

Heat-resistant Transfers
Meyercord Co. *USP* 2,941,916 (19 Oct 1956)

Transfers for use on surfaces to be heated to 300–1000°F contain silicones as the main ingredient of the transfer body. C.O.C.

Transfers
A. Forti *BP* 867,286 (7 Mar 1959)

The design to be transferred is printed upon metallic foil, e.g. Al strip 0·02–0·06 mm thick, using a printing cylinder and an ink made of thermoplastic material and a high proportion of pigment. Because of its thinness the metallic foil has a small mass to be heated, so that during transfer of the design the working temperature is reached easily and quickly. The metal foil also renders the surface of the transferred design shining and brilliant. C.O.C.

Colour Couplers (IV p. 324)

Colouring Cellulose Acetate and Nylon with Metallised Unsulphonated Azo and Azomethin Dyes (VIII p. 336)

X—SIZING AND FINISHING

Importance of Odour Control in Textile Processing
B. K. Tremaine
Amer. Dyestuff Rep., **50** (6 Mar 1961) P175–P180

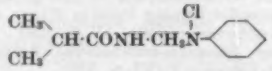
The use within the textile industry of odour-control products is described, and details are given of odour measurement, selection of materials (to meet both the chemical and physical requirements for stability), odour intensity, and unit threshold values. The practice of re-odourisation to overcome bad odours associated with various resin finishes and data covering such practices are reported. S.B.D.

Water-repellent Finish
W. Krause *Tinctoria*, **58** (Feb 1961) 49–58

Methods of making textiles water-repellent are surveyed— (1) Separate treatment with soap and Al salts. (2) Treatment with emulsions containing paraffin and Al salts. To obtain stable emulsions paraffin must be dispersed very finely (0·1–2 μ). (3) Better results are obtained if zirconium instead of Al salts are used. (4) Esterification— Efforts to make cellulosic material water-repellent by forming surface layers of cellulose stearate were not successful. Much better results can be obtained by using alkylisocyanates. (5) Etherification— Of special interest are compounds of the type stearamidomethyl pyridinium chloride. They are believed to form ethers with cellulose at high temp. They impart not only water-repellency but also a soft handle. (6) Co-ordination compounds of a fatty acid and chromium (II) chloride— A polymer is believed to be formed, the mechanism being given. On heating and dehydration, films of high-mol.-wt. compounds are formed on the fabric, the aliphatic groups pointing outwards and thus imparting water repellency. The polymer is bound to the fibre by the residual co-ordination forces of the chromium. The method is especially suitable for wool. A disadvantage is the intrinsic colour of the chromium compounds. (7) Greatly improved results can be obtained by the combined use of substituted aminoplasts and water-repellent agents. The aminoplasts reduce water absorption, the long aliphatic chains have a water-repellent effect, and they can serve as anchorage for paraffin to increase the effect still further. (8) Silicones— Dimethylsilicones, monomethyl (hydrogen) silicones or mixtures of the two are used in form of pre-condensates. Dimethyl silicones can only form linear polymers but hydrogen silicones may also form three-dimensional networks. Synthetic fibres, because of their low absorptive power, do not readily take up water-repellent preparations, but good results are obtained with silicones. Solvents contained in some silicone emulsions improve the effect by promoting swelling of the fibre, and pretreatment with carriers, as used in dyeing synthetic fibres, is still more effective. 36 References. W.M.

Reactive Finishing Agents for Cellulose
L. H. Marcou *Teintex*, **26** (15 Mar 1961) 165–183

The finishing of cellulosic fibres is continued from Part I (*ibid.*, **26** (15 Feb 1961) 89); J.S.D.C., **77** (June 1961) 270) with reference to the use of (i) $\omega\omega$-dichloro compounds, e.g. condensate of diethylene glycol (62 parts) and epichlorohydrin (300), which gives a finish of excellent wash fastness, showing no yellowing with Cl_2, (ii) compounds containing ethylene oxide groups; these give inferior rubbing fastness to methylol types, but are odourless and give excellent washing fastness. Their high cost has led to their use in mixtures with, e.g. dimethylol-ethylene urea, (iii) pyridinium salts, e.g. cotton is impregnated in liquor containing thermoplastic resin (50 g/l.) and then treated in a solution of the pyridinium salt of dichloromethyl ether of glycol (60), sodium acetate (20), and water (920) to give a finish of excellent washing fastness, (iv) acetals, and (v) miscellaneous compounds, especially the condensates of ethylene imine with $POCl_3$ and cyanuric chloride, isocyanates and—



The advantages and disadvantages of all types are tabulated. Permanent pleating of wool is discussed. The Si-Ro-Set process, in which cystine links are broken by means of ammonium thioglycollate, has disadvantages since this is toxic, is a reducing agent which affects many dyes and is reactive with certain metals. A better process is the Immacula process using sodium metabisulphite. Felting of wool is fully discussed, together with the two principal methods of treatment, *viz.* modification of fibre structure (by, e.g. Cl_2, oxidation in absence of Cl_2, alkali treatment) or coating of the fibre (e.g. with Epon 562 or Versamide 115, condensates of polyfunctional amines with dimeric fatty acids). A.T.P.

Dimethyloltriazone Finishing Agents with Long-chain Alkyl Substituents for Cotton Textiles
S. L. Vail, J. G. Frick, Jr., P. J. Murphy, Jr., and J. D. Reid *Amer. Dyestuff Rep.*, **50** (20 Mar 1961) 200–204

The softening effect on cotton fabrics of three new methylolated triazones increases with the chain length of the alkyl group (octyl, dodecyl, and octadecyl), but only the octyl compound is useful for improving crease resistance. W.G.C.

Studies on Textile Finishing Agents. XX—Resin Finishing of Cellulosic Fabrics with Emulsion Copolymer containing *N*-Methylolacrylamide
H. Kamogawa, R. Murase, and T. Sekiya
J. Soc. Textile Cellulose Ind. Japan, **17** (Feb 1961) 183–189

Changes in the mechanical properties and durability of cotton and viscose rayon fabrics finished with emulsion copolymers of *N*-methylolacrylamide (MAM) and acrylic esters, including ethyl and butyl acrylate, have been investigated. (1) Durability to laundering of the polymer-treated and acid-cured fabric increases with increase in the MAM-content in the polymer. This can be attributed partly to the improvement in tensile strength and elastic properties of the copolymer resulting from formation of cross-links between the polymer chains during the acid curing, and partly to the reaction of the methylolamide groups of the polymer with the hydroxy groups of the cellulose. (2) This improvement in the tensile strength and elastic properties of the cured copolymer also results in an improvement in the crease recovery of cotton, and in the abrasion resistance of both fabrics. (3) Despite the remarkable changes in stress-strain properties of acid-cured acrylate polymer on copolymerisation with only a small amount of MAM, the mechanical properties of the treated fabrics, e.g. tear strength, show no marked improvement. I.G.L.

Improved Crease Recovery of Cotton by Reaction with Formaldehyde
S. J. O'Brien and W. J. van Loo
Text. Research J., **31** (Mar 1961) 276–281

Data are given showing the reaction of cellulose with cotton, using phosphoric acid, $MgCl_2$, and Zn nitrate as catalysts and of the resulting improvement in crease recovery. A theoretical equation fitting the relationship between improvement in crease recovery and the concentration of the formaldehyde reacted with cotton suggests that only part of the reacted formaldehyde is concerned in cross-linking of the cellulose molecules. C.O.C.

Cotton Quality Study. VI—Crease Resistance and Recovery from Deformation
H. Tovey *Text. Research J.*, **31** (Mar 1961) 185–252

Review of the literature, 820 references. C.O.C.

Changes in Properties of Partially Phosphonomethylated Cotton caused by Cross-linking Prior to Phosphonomethylation
S. R. Hobart, G. L. Drake, Jr., and J. D. Guthrie
Amer. Dyestuff Rep., **50** (6 Feb 1961) 92–96

Cross-linking the cellulose of cotton fabrics with dichloropropanol before phosphonomethylation with disodiumchloromethyl phosphonate made possible a higher degree of substitution without loss of fabric structure and as a result the flame resistance, cation-exchange capacity, resistance to microbiological degradation, and moisture content were increased. W.G.C.

Location of Resin Finish in Viscose Rayon Fabrics
J. E. Ford; G. S. Park J.S.D.C., **77** (May 1961) 209–210

Influence of Fibre Storage on Cloth Dimensions, and Changes during Finishing
J. Lawes and M. Townsend
J. Textile Inst., **51** (Dec 1960) T1274–T1289

Storage of tops and rovings produces latent fibre strain, and removal of this strain in finishing causes more shrinkage of the cloths. In London shrinking the width of a cloth can be increased by tentering to a greater width after dyeing; this extra width may be lost on later relaxation if the cloth has not been crabbed. London shrinking can reduce latent strains in finished cloth by about 50%, but residual strains remain, particularly lengthways. Crabbing may introduce a yarn set that is permanent to dyeing at the boil and to subsequent wet shrinking. M.T.

Application of Descaling Technique to Theory of Shrinkproofing of Wool
J. H. Bradbury
J. Textile Inst., **51** (Dec 1960) T1226–T1236

Lincoln 36s wool fibres were submitted to acid chlorination or to treatment with SO_2Cl_2, $KMnO_4$, alcoholic NaOH, aqueous NaOH, or ultraviolet radiation. The treated fibres were examined microscopically, frictional measurements were carried out, and whole fibre and cuticle-rich material were analysed for amino acids and amide-nitrogen. In all treatments, except that with alcoholic NaOH, fission of disulphide bonds is the primary chemical action leading to shrinkproofing. Shrinkproofing by degradative chemical methods is considered to be a function of modification of surface properties and of whole fibre properties. Efficacy of shrinkproofing parallels severity of surface modification when there is little or no attack on the whole fibre. Loss in cystine in cuticle or in whole fibre, and frictional properties show no correlation with degree of shrinkproofing. M.T.

Reducing Felting Shrinkage of Wool
F. H. Steiger
Amer. Dyestuff Rep., **50** (6 Feb 1961) P97–P102

The shrinkage of wool is reduced by treatment with a cross-linking acrylic polymer without appreciably affecting the handle of the fabric. W.G.C.

Permanent Antistatic Finishing of Highly Bulked Polyacrylonitrile Yarn
K. Mahall *Textil Praxis*, **16** (Mar 1961) 279–282

A short description of the troubles caused by static electricity in knitted goods is followed by details of methods of producing highly bulked yarn having permanent antistatic finish. A simple test for the effectiveness of an antistatic finish is also given. P.B.S.

PATENTS

Reflex-reflecting Yarns
Minnesota Mining & Manufacturing Co.
USP 2,937,668 (29 Oct 1956)

Yarn is coated with a viscid adhesive and then with minute, silvered, spherical beads of a glass of refractive index $\leq 1{\cdot}9$. The process is such that the beads are half embedded in the adhesive. After the adhesive is set the coated yarn is passed through a bath of acid to remove the silver from the exposed half of each bead, neutralised and dried. This yields a yarn which is normally light grey but when light is directed into it, e.g. from a car's headlamps, a brilliant cone of light is reflected back toward the source of light. The coated yarns are strong, pliant and durable, and readily knitted or woven. C.O.C.

Wet Processing of Textiles
R. Augsten *BP* 859,726 (Germany 2 Nov 1957)

A moving relaxed textile web is bent along a line at right angles to its length by a succession of short mechanical impacts imparted from one side while on the other side a stream of liquor is directed counter to the impact into the part of the web opened by the bending action. This greatly facilitates penetration of the liquor into the fabric. C.O.C.

Imparting Crease-recovery Properties, Dimensional Stabilisation and Increased Affinity for Dyes to Cellulosic Fabrics
Rohm & Haas Co. *USP* 2,940,817 (29 Jan 1957)

The goods are treated with a poly(vinyloxyalkyl)amine so that it reacts exclusively with the OH groups of the cellulose and does not form a resin. Thus cotton cloth was impregnated with its own weight of 7·5% aq. soln. of n-butyl(di-(2-vinyloxyethyl))amine, brought to pH 5–6 with HCOOH, dried for 5 min at 240°F, baked for 5 min at 325°F, and given an alkaline wash. The treated fabric had good crease recovery and dyed a deep blue with Direct Brilliant Blue 5BC (C.I. Direct Blue 25), whereas an untreated control was only tinted a very light blue. C.O.C.

Controlling Formation of Aldehyde or Amine Odours in Fabric treated with Resins
West Point Manufacturing Co.
USP 2,928,758 (13 Dec 1958)

Modification of *USP* 2,870,014 (J.S.D.C., **75** (1959) 440). For materials, e.g. cotton previously rendered water-repellent by conventional resin treatment, and resin-treated rayon or high-twist cotton fabrics, where the

HSO_3^- ion is applied after partial or complete curing of the resin, the amount of HSO_3^- ion needed to obtain effective odour control may be materially reduced if the cured material is impregnated with HSO_3^- ion in presence of an alkaline solution at pH 6–12. Thus rayon cloth impregnated with dimethylol urea and then cured was impregnated with 65% of its weight of 10% aq. $NaHSO_3$, dried and baked at 250°F for 2 min. This yielded a cloth which had some smell when severely steamed. Cloth similarly treated, but using only 4% aq. $NaHSO_3$ with addition of ammonia to bring the solution to pH 7–8, did not smell even when severely steamed. C.O.C.

Alkali-soluble Cotton Textiles
U.S. Secretary of Agriculture
USP 2,938,765 (11 Apr 1957)

The cotton is chemically modified by any suitable method, but preferably by aminoethylation or carboxymethylation, so as to obtain a degree of substitution ≯ 0·33 and preferably 0·01–0·10. This virtually does not affect the textile properties of the cotton. It is then oxidised with an aq. soln. of chromic and oxalic acids, preferably at 20–25°C. The products are very suitable for use as scaffolding yarns. C.O.C.

Coating Rayon Fabrics with Vinyl Resin Film
American Viscose Corpn. *USP* 2,940,889 (29 June 1955)

Rayon cloth is either treated with an alkylenimine or made from yarn which has been so treated and is then united with a vinyl resin film to form a coated fabric. C.O.C.

Reactivity of Some Epoxides toward Cellulose (III p. 320)
Action of Tetrakis(hydroxymethyl)phosphonium Chloride on Wool and Hair (VI p. 332)
Effect of Laundering Methods on the Creasing of "Wash-and-Wear" Cotton Shirts (VII p. 334)
Symposium— Dyeing and Finishing of New Cellulosic Fibres (VIII p. 335)
Recent Developments in Dyeing and Finishing of Hosiery Yarns and Knitwear (VIII p. 335)
Conditioning Polyester Textiles for Dyeing and Imparting Anti-pilling Properties (VIII p. 337)
Coating by Electrodeposition (IX p. 337)
Behaviour of Textiles treated with Antistatic Agents in Wearing and Washing Tests (XIV p. 343)
Studies of Crease-resist Finishes for Cotton Textiles. III— Accelerated Storage Test for "Wash-and-Wear" Cotton Fabrics (XIV p. 343)

XI— PAPER AND OTHER CELLULOSIC PRODUCTS

PATENTS

Rosin Size
American Cyanamid Co. *BP* 866,649 (10 Apr 1959)

Formaldehyde acts as a fortifying agent by irreversibly reacting with rosin, and sizes made from the modified resin impart to paper increased resistance to aqueous fluids, e.g. water and ink. C.O.C.

Rosin Size for Paper
Hercules Powder Co. *USP* 2,941,919 (31 Jan 1957)

The efficiency of sizes derived from tall oil rosin is improved by giving the tall oil rosin a preliminary treatment with HCHO in presence of an acid catalyst. C.O.C.

Improving the Stability of Fibrous Cellulosic Materials to changes in Atmospheric Moisture and Temperature
A/S Jens Villadsen's Fabrikker
BP 860,992 (Denmark 29 Feb 1956)

Dimensional stability against variations in atmospheric humidity is given to paper and other fibrous cellulosic materials by treatment at 100–250°C in an atmosphere containing keten or a polymer or a linear homologue thereof until the cellulose has increased in weight by 2–7%. C.O.C.

Comparison of Hydrocelluloses from Unmercerised and Mercerised Cotton (VII p. 334)
Vapour Treatment of a Moving Web— Bleaching Paper with Hydrogen Peroxide Vapour (VII p. 334)
Coating by Electrodeposition (IX p. 337)

XII— LEATHER; FURS; OTHER PROTEIN MATERIALS

Effects of Organic Acids on Fixation of Chromium and Zirconium by Chemically Modified Collagen
R. L. Sykes and D. A. Williams-Wynn
J. Soc. Leather Trades Chem., **45** (Mar 1961) 83–91

The extent to which different anions influence Cr fixation and tanning action can be explained in terms of their relative complex-forming tendencies. The effect of organic acids on Zr appears to be similar, but it is not certain that a co-ordination reaction is involved. Observed effects such as the reduction in fixation and relative increase in shrinkage temp. may reflect the relative particle sizes of the complexes. The chloride tanning salts of both metals have less affinity for hide protein than have the sulphate salts; this may be due to the greater stability of the metal-to-metal bridge in the presence of SO_4^{2-}. Chrome tanning is thought to be effected by the formation of a co-ordinate bond between the Cr complex and charged COOH groups on the protein side-chains; Zr fixation may take place through multi-point attachment of large polynuclear metallic complexes by residual valency forces. J.W.D.

Production of Patent Leathers Finished with Polyurethane Lacquers
–. Speicher *J. Soc. Leather Trades Chem.*, **45** (Mar 1961) 104–124

Patent leathers finished with polyurethane lacquers have considerably better fastness properties than those finished with lacquers based on linseed oil. Light-coloured finishes are possible in addition to the usual black. A survey is given of the chemical mechanism on which two-component polyurethane lacquers are based. Properties and applications are discussed. J.W.D.

PATENTS

Alum Tannage
U.S. Secretary of Agriculture
USP 2,942,930 (7 Nov 1958)

Stable and irreversible tannage is obtained by tanning the skins with an aq. soln. of an aluminium salt and then treating with a polymer of acrylic acid or Na or NH_4 polyacrylate. The resulting leather is white and may be fat-liquored in the usual manner or retanned with vegetable tannin. C.O.C.

Tanning with Acetonylacetone
U.S. Secretary of Agriculture
USP 2,938,763 (20 Feb 1956)

Acetonylacetone used as a tanning agent in either aqueous or organic solvent solution at pH 7–11 gives rapid tanning and yields a leather which is soft and flexible, even without oiling or other softening treatment. The pH must be ≮ 7, as at pH 5 acetonylacetone has no tanning action and at pH 5–7 although it tans the resulting leather is very hard and brittle. C.O.C.

Tanning with Glutaraldehyde
U.S. Secretary of Agriculture
USP 2,941,859 (8 Apr 1959)

Glutaraldehyde is an excellent tanning agent, its action being very rapid over an extremely wide pH range. Leather obtained by its use has excellent appearance, flexibility, stability and fastness to perspiration. The leather has reversible shrinkage, i.e. when heated above its shrinkage temperature in presence of water, it shrinks, but expands to its original dimensions on cooling. This cycle of shrinkage and expansion is repeatable without any apparent change in the leather. C.O.C.

Patent Leather
H. S. Lyness *USP* 2,937,957 (22 May 1958)

Patent leather of uniform and superior gloss, increased flexibility and elasticity, and which does not become brittle on ageing is obtained by giving a coating of nylon lacquer at some stage before the final coating of patent leather finish is applied. Thus the nylon lacquer can be sprayed on to the partly finished leather over two coats of oil or varnish and after drying the final finish coat applied, or the nylon lacquer may be mixed with the oil or varnish applied as one of the early base coatings. C.O.C.

Melting Equilibrium for Collagen Fibres under Stress: Elasticity in the Amorphous State (VI p. 333)
Coating by Electrodeposition (IX p. 337)

XIII— RUBBER; RESINS; PLASTICS

Electron Microscopy— Recent Applications to Crystallinity and Morphology of Synthetic and Natural Polymers
J.-J. Trillat and C. Sella
Bull. Inst. Text. France, (92) (Jan.–Feb 1961) 35–90
Review— 87 photographs. J.C.F.

Mechanical Behaviour of Swollen Polystyrene, Poly-*p*-Chlorostyrene and their Copolymers in Benzene. II— Stress-relaxation under Constant Strain
K. Ogino *Bull. Chem. Soc. Japan*, **34** (Feb 1961) 153–157 (*in English*)

Stress-relaxation curves for cross-linked gels of polystyrene, poly-*p*-chlorostyrene, and their copolymers are given at three temperatures. The initial modulus and the apparent activation energy of relaxation increase with increasing chlorine content. The viscosity of the polystyrene is considerably greater than that of the chlorine-containing polymers. The results are interpreted in terms of the effects of introduction of chlorine atoms on inter-chain forces. W.R.M.

Selectivity in Radiation-induced Cross-linking and Scission of Polyvinyl Alcohol
Y. Hirano and A. Amemiya
Bull. Chem. Soc. Japan, **34** (Feb 1961) 292 (*in English*)

Scission and cross-linking by irradiation of dry and water-swollen polyvinyl alcohol have been studied. Only special types of bonds, e.g. those of the 1,2-glycol type, appear to be broken in dry and swollen samples. Bonds formed by cross-linking in dry samples are of a special type susceptible to oxidation by periodic acid. In swollen samples at least two types of bond are formed in cross-linking, only one of which is susceptible to oxidation. W.R.M.

Radical Polymerisation of *N*-Carboxy-dehydroalanine Anhydride and of *N*-Phthaloyl-dehydroalanine— Synthesis of a New Amphoteric Polymer
S. Sakakibara *Bull. Chem. Soc. Japan*, **34** (Feb 1961) 174–177 (*in English*)

Homopolymers of *N*-carboxy-dehydroalanine anhydride and of *N*-phthaloyl-dehydroalanine (II) and copolymers of the latter with vinyl acetate have been prepared and subjected to hydrolysis or hydrazinolysis to obtain polymers with α-amino acid structures. Structures of the polymers are discussed. W.R.M.

Resonance Effect of Amide Group on Polymerisability of Lactam Derivatives
N. Ogata

I— Infrared Spectra of *N*-Methyl Lactams
Bull. Chem. Soc. Japan, **34** (Feb 1961) 245–248 (*in English*)

Infrared spectra of several *N*-methyl lactams and acid amides have been measured in chloroform solution. The reduction in frequency of the amide I band by *N*-methyl substitution can be related to the increasing contribution of the ionic structure to resonance in the amide group and to low polymerisability.

II— Basicity of the Amide Group of Lactams
Ibid., 248–254

Infrared spectra are used to study the addition of hydrogen chloride to cyclic and chain amides. The equilibrium constant for the reaction increases with ring size, is 30–40 for *N*-methyl lactams and 60 for a secondary chain amide. The heat of reaction decreases with increasing size of the lactam ring and with *N*-methyl substitution of the amide hydrogen. Stronger basicity of the *cis*-amide compared with the *trans*- may be due to decreased resonance in the amide group, and stabilisation of the lactam ring by *N*-methyl substitution may be due to increased resonance by hyperconjugation of the methyl group. W.R.M.

Acrylic Esters in Copolymer Latices
H. D. Cogan *Off. Dig. Fed. Soc. Paint Technol.*, **33** (Mar 1961) 365–379

Report of a systematic study of the latices obtained by copolymerising vinyl acetate with various acrylates, including ethyl, butyl, isobutyl, 2-ethylhexyl, and decyl acrylates, in a range of concentrations. Copolymer latices have been prepared also from vinyl acetate with dibutyl maleate or dibutyl fumarate, in such a way as to permit direct comparison of latices and the films or paints prepared from them. J.W.D.

Thermosetting Acrylic Resins
W. H. Graeff, A. M. Levantin, and E. E. Wormser
Off. Dig. Fed. Soc. Paint Technol., **33** (Mar 1961) 345–364

Acrylic polymers are now available, in both solution and emulsion form, that cross-link to form hard, infusible, solvent-resistant coatings on baking. They share also the colour, gloss, durability, stability, and resistance of normal acrylic polymers. Both emulsion and solution types are compatible with other film-forming materials which may thus be used to modify their properties. Methods of formulation and the effect of formulation variables on film properties and application conditions are given. J.W.D.

Alkyd Copolymers for Solvent Coating Systems
R. H. Wholf, D. C. Davis, and H. A. Hoppens
Off. Dig. Fed. Soc. Paint Technol., **33** (Feb 1961) 220–251

The properties of coating systems based upon recently developed copolymers of alkyd type are reviewed and discussed in detail, with the aid of 31 tables. Acrylic copolymer systems have improved detergent, humidity, and chemical resistance, high initial gloss, and good gloss and colour retention. Silicone alkyds have excellent heat resistance and colour retention at high temp., and are of outstanding outdoor durability. Epoxy silicone alkyds have high resistance to chemical attack, and give good adhesion to metals that are normally difficult, e.g. Cu, Al, and galvanised iron. Fast-curing melamine coating resins give finishes that are very hard and, combining reduced melamine concn. with rapid conversion at low temp. reduce costs and speed production. J.W.D.

PATENTS

Rendering Polyethylene Antistatic and More Receptive of Dyes
Dow Chemical Co. *USP* 2,937,066 (23 Nov 1955)

The polyethylene is treated with H_2SO_4 of strength < 98%, oleum, or anhydrous solutions of oleum. The treatment, if carefully carried out, does not affect any pigments, stabilisers, or other additives present in the polyethylene. The treated polyethylene is antistatic and has good affinity for many dyes, particularly basic dyes. C.O.C.

Rendering Polyethylene and like Polyolefins Permanently Transparent
W. R. Grace & Co. *BP* 866,819 (28 May 1958)

The polyolefin is heated till it becomes transparent and is then quickly cooled, e.g. by drenching. It is then irradiated with high-energy ionising radiation using a sufficient dose to render the transparency resistant to heating the material to the transition point and slowly cooling.

BP 866,820 (28 May 1958)

A polyolefin which has been orientated to some extent by stretching is irradiated with high-energy ionising radiation to produce a limited amount of cross-linking, heated, uni- or bi-axially orientated by either stretching or calendering, and finally cooled. This yields a product of increased tensile strength, particularly at 88–100°C, and improved clarity and surface gloss. The transparency obtained is resistant to heat practically up to the transition point.

BP 866,821 (28 May 1958)

Polyethylene which has been orientated to some extent by stretching is heated by a hot fluid and then biaxially orientated by hot stretching.

BP 866,822 (28 May 1958)

Polypropylene or propylene copolymers which have been orientated by stretching are heated by a hot fluid and, while hot, biaxially orientated by calendering or stretching. C.O.C.

Linoleum
J. W. Ayers & Co. *USP* 2,936,243–4 (30 June 1955)

Adding a compound of formula AlXYZ (X = alcoholate, phenolate or acylate; Y and Z each = alcoholate, phenolate or acylate or together = O; Y may be OH when only one of X and Z = acylate), Al hydrate or oxo-aluminium oleate to a linoleum compound based on either a drying

oil or tall oil renders the sheets made from it more resistant to water, alkali, and wear. C.O.C.

Patterned Sheet Material

Semtex *BP* 865,966 (3 Oct 1956)

Modification of *BP* 736,009. Imperforate variegated sheets are prepared from a thermoplastic composition or vulcanisable rubber composition by passing two or more imperforate sheets of the composition of different colours between the nip of a calender so as to intermingle the two differently coloured compositions. The resulting sheet or several such sheets are then combined with a base sheet of the same composition and colour as one of the original sheets. The combined sheets are then calendered while still plastic so as to reduce their thickness. Where a rubber composition is used it is finally vulcanised. C.O.C.

Contrast Colour-embossed Plastics

Dymo Industries *BP* 866,024 (2 July 1959)

Some rigid plastic sheet materials develop a highly contrasting or opaque colour in regions subject to cold flow, i.e. viscoelastic deformation. Thus when such sheeting is embossed the raised portion has a colour contrasting with the original background colour. Thus unplasticised, unfilled (unpigmented) polyvinyl tape containing a little lubricated stabiliser is normally semi-transparent opalescent bluish white. On being cold-embossed the raised areas become an opaque white. C.O.C.

Rare-earth Metal Oxides and Hydroxides as Stabilisers for Silicone Elastomers

Midland Silicones *BP* 867,066 (U.S.A. 28 Nov 1958)

Incorporation into diorganopolysiloxanes of 0·001–8·0% of their weight of a lanthanide rare-earth metal or hydroxide, e.g. $Ce(OH)_4$, stabilises them without otherwise affecting their physical appearance. C.O.C.

Preventing Discoloration by Iron in Plastics

Argus Chemical Corpn. *USP* 2,943,070 (11 Oct 1957)

Incorporation of an organic polyol prevents discoloration by any iron present. Thus polyvinyl chloride composition reinforced with unpurified asbestos rapidly discolours on heating, whereas a similar sample to which pentaerythritol has been added retains its original colour even when heated for 2 h at 300°F. C.O.C.

Optical Rotatory Dispersion of Dyes Bound to Macromolecules— Dye–Polyglutamic Acid Complexes (IV p. 321)
Water-dispersed Industrial Coatings (V p. 330)
Dispersing Pigments in a Solution of an Acrylonitrile Polymer (VI p. 334)
Dyeable Polypropylene-based Polymeric Products (VI p. 334)
Coating by Electrodeposition (IX p. 337)

XIV— ANALYSIS; TESTING; APPARATUS

Automatic Titration Instrument with Means of Recording the Course of the Titration

S. Wolf *Chemiefasern*, 11 (Mar 1961) 184–186

The apparatus described, the Metrohm-Potentiograph E336, is a recording instrument for the measurement of potential in combination with a mechanical system giving positive coupling of the Kolbenburette (*Chem. Rund.*, 10 (1957) No. 18) with the movement of the paper in the recorder, i.e. the amount of titration reagent run in from the burette is directly proportional to the forward movement of the paper, and by this means a titration curve is obtained. The amount of reagent added is read off by means of the ml subdivisions on the paper. For a run-through, the length of paper required is 376 mm and, depending on the size of the Kolbenburette (5, 10 or 20 ml), 0·0075, 0·0150 or 0·0300 ml, respectively, can be read off with ease. The speed of titration can be varied from 0·08 to 5·00 ml/min. Details of the instrument, its use and advantages are given. In addition to potentiometric, pH-, redox-, precipitation-, and complex formation-titrations without current, these determinations can also be made under constant current (voltametric titration). The range of applicability is wide, the use of the instrument being particularly advantageous when end-points are normally difficult to detect, e.g. titrations in solvents. By means of multi-stage titrations, more than one compound in a mixture can be determined, e.g. a mixture of benzoic acid and α-naphthol. It may also be used for potentiometric determination of the carboxyl end-group content of high-molecular-weight polyaminocaproic acids. The instrument can also be used to obtain a simple plot of change in potential or pH with time in tracking the progress of a reaction. I.G.L.

Studies in the Light Absorption of Dyes. III— Absorption Spectra of Dyes in Solution and Adsorbed in Solid Films

C. H. Giles, S. M. K. Rahman, and D. Smith *J.C.S.*, (Mar 1961) 1209–1215

The conclusions drawn from an examination of a large number of dyes (anthraquinone, azo, etc.) including also reactive dyes, is that almost all of them have two absorption bands in the visible region, which are tentatively identified with Lewis and Calvin's x and y bands (cf. *Chem. Rev.*, 25 (1939) 273), the shorter (y) increasing in height relative to the larger (x) with increase in concn.; this is attributed to aggregation. There is also a shift of both peaks with change in solvent (solvatochromic effect). The main (x) band of many dyes shifts to longer wavelengths when the dye is adsorbed on cellulose. The changes in the ratio of heights of the two bands with changes in concn. are analysed statistically. H.H.H.

Electronic Structure and Physico-chemical Properties of Azo Compounds. IX— Absorption Spectra of the Benzologues of Azobenzene, Benzalaniline, and Stilbene

J. Schulze, F. Gerzon, J. N. Murrell, and E. Heilbronner *Helv. chim. Acta*, 44 (15 Mar 1961) 428–441

Absorption spectra of the title cpd. and their benzologues $R^1–N=N–R^2$, $R^1–CH=N–R^2$, and $R^1–CH=CH–R^2$ (where R^1 and R^2 = phenyl, 1-naphthyl, and 2-naphthyl) are compared qualitatively. A theoretical treatment is to follow. H.H.H.

Quinones. III— o-Semiquinones and their Use as Sensitive Reagents for Calcium

R. Ott *Mh. Chem.*, 92 (28 Feb 1961) 1–7

Alkaline solutions of phenanthrene-9,10-quinone-1-carboxylic acid, and of potassium phenanthrene-9,10-quinone-2- and -3-sulphonate, are found to be very sensitive colour (deep green) reagents for calcium, as compared with strontium and barium. The semiquinonoid nature of the complex salt formed is discussed, and the semiquinone radical is also shown to be the cause of the Bamberger colour reaction with o-quinones (cf. Bamberger, *Ber.*, 17 (1884) 455; 18 (1885) 865; Ott, *Mh. Chem.*, 86 (1955) 622). H.H.H.

Anthraquinone and Anthrone Series. XXIV— High-temperature Chromatography of Vat Dyes

M. K. Unni and K. Venkataraman *J. Sci. Ind. Res. (India)*, 19B, No. 9 (1960) 355–359

Apparatus and procedure for chromatography of vat dyes on Al_2O_3 at 110–200°C are described. The Al_2O_3 column is built by wet packing and maintained at constant temperature (± 1 deg. C). A temperature of 110°C is most generally useful, higher temperatures tending to give diffuse bands and poor separation. The dye or dye mixture is added as a hot solution or suspension, and development and elution are carried out with, e.g. o-dichlorobenzene, trichlorobenzene, phenol, o-chlorophenol, m-cresol. Components usually crystallise from the hot eluent; several quantitative separations of mixtures were carried out, e.g. indanthrone from flavanthrone, iso-dibenzanthrone from dibenzanthrone. In the dibenzanthrone series, derivatives arranged in order of increasing adsorbability were 16,17-dimethoxy-, unsubst-, 16-nitro-, 16-amino-, and 16-benzamido-. A.T.P.

Conjugated Macrocycles. XXXII— Absorption Spectra of Tetrazaporphins and Phthalocyanines. Formation of Pyridine Salts

M. Whalley *J.C.S.*, (Mar 1961) 866–869

The absorption spectra of metal-free tetrazaporphins in chlorobenzene or 1-chloronaphthalene normally show two bands of high intensity in the visible region, but in pyridine (free from metal ions) the spectra are similar to those of their metal deriv., apparently because of formation of pyridinium salts. Redeterminations of the electronic absorption spectra of phthalocyanines (metal-free, Cu, Ni, Co, Fe·2py, Fe, Zn·py, Mg·H_2O, Pd, Pb and Sn) made with photoelectric instead of visual instruments are now

recorded. Chromatography has established that stannic phthalocyanine is homogeneous and not a mixture or mol. complex of phthalocyanine and its stannous deriv.
H.H.H.

Luminescence Analysis in Filtered Ultraviolet Light
H. Schröder *Textil Praxis*, **16** (Jan 1961) 12–16

After describing the nature of light and the electronic structure of atoms, the author explains the principles of luminescence, phosphorescence, and fluorescence. Sources of ultraviolet radiation, e.g. high-pressure mercury vapour lamps, can be used as convenient aids in textile analysis for identification of fibre mixtures, oil stains, fluorescent brightening agents, and chemical damage. It is advisable to supplement this information by other tests.
L.A.T.

Measurement of Gloss
A. C. Elm *Off. Dig. Fed. Soc. Paint Technol.*, **33** (Feb 1961) 163–180

Gloss meters at present used in the paint industry measure the intensity of the light reflected by a given surface in a specular direction; they fail to take into account surface haze or bloom, which are detrimental to the sensation of glossiness. Improved gloss meters are needed. Attempts to find a correlation between loss of gloss and changes in the surface structure of paint coatings during exposure have been unsuccessful. It is concluded that light scattering from within the paint film is a dominant factor. Pigmented systems must be thoroughly deflocculated to yield the freedom from surface haze and the depth of gloss required with high-grade enamels.
J.W.D.

Ultraviolet Accelerated Testing Method for Gloss Retention of Paints
Golden Gate Society for Paint Technology *Off. Dig. Fed. Soc. Paint Technol.*, **33** (Feb 1961) 268–282

An accelerated test method, based on exposure to ultraviolet radiation under specified conditions, is used by the Standard Oil Co. for determining the gloss retention of paints. Apparatus, method of operation, and calibration are described (2 diagrams), and results of testing long-oil alkyd paints are reported and compared with actual exposure data on similar paints. It is concluded that the validity of the method in its present form is open to question.
J.W.D.

A New Felting Test for Loose Wool and Worsted Tops
G. Blankenburg and H. Zahn *Textil Praxis*, **16** (Mar 1961) 228–232

The sample (1 g) is pulled out to an open state and placed in a small bottle (100 ml) with buffer solution (50 ml). The bottle is shaken in a machine for ca. 1 h and the ball of felt formed is then removed and dried. The average diameter of the ball is used in a formula to give the felting thickness. The influence of various factors, i.e. shaking time, bottle shape and position, quantity of liquid, shaking frequency, etc., on the felting thickness is examined in detail.
P.B.S.

Shade Control for Military Textiles used by the U.S. Army Quartermaster Corps
F. J. Rizzo *Amer. Dyestuff Rep.*, **59** (20 Mar 1961) P211–P220

The tolerances required in shade control of military textiles by the U.S. Army may be closer than in commercial textile transactions and this raises problems of matching and colour measurement; as a result, colour-matching conditions have been stabilised, standard formulations have been adopted for the preparation of shade samples, and efforts have been made to establish tolerance ranges which satisfy military requirements and are within limits of commercial production.
W.G.C.

Light Fastness of Dyes on Textiles
C. H. A. Schmitt *Canadian Textile J.*, **78** (20 Jan 1961) 45–52

Light-fastness assessment is discussed. The importance of prediction of end-use fastness in testing, and the effect of optimum dyeing procedure and of various manufacturing processes on light fastness are stressed. Factors which contribute to good and bad results in both daylight and Fade-Ometer testing are reviewed, and the use of the Weather-Ometer and the Humidifier-type Fade-Ometer for duplicating Florida sun tests is described. The effect on the light fastness of the dyed fibre of (*a*) dyebath pH when acid dyes are applied to wool, (*b*) carriers in synthetic-fibre dyeing, (*c*) sequestering agents used in applying copper-containing dyes and application of these dyes in conjunction with copperable dyes, and (*d*) the optimum methods for dyeing 2:1 metal-complex dyes, are described. The importance of considering the separate and cumulative effects of fulling, carbonising and decatising, and finishing processes on the light fastness of dyed fibres is emphasised.
W.P.M.

Behaviour of Textiles treated with Antistatic Agents in Wearing and Washing Tests
E. Wagner *Chemiefasern*, 11 (Mar 1961) 187–191

The origin of electrostatic charge in synthetic fibres, and the means of minimising or eliminating difficulties associated with this phenomenon are reviewed. These methods are varied, and occasionally lead to conflicting conclusions. It is shown that the behaviour of textiles treated with antistatic agents can be fully comprehended only within very narrow limits, and that it is not possible to assign universal properties to any particular agent. In the experiments described, measurements of field strength were made. Full details of the technique employed are given. Half-life periods for the loss of charge (a function of electrical conductivity) have been determined, i.e. the time taken for half the original charge on the fabric to be lost, and the course of the discharge has been plotted by means of a recorder. The fall in field strength is compared using various antistatic agents (a permanent agent based on a cationic resin, and those easily removed by washing that have a phosphoric acid ester and fatty acid basis). Other experiments on treated and untreated polyester samples demonstrate the effect of humidity on the discharge. From the graphical data, the half-life for untreated fabric is strongly dependent on r.h., falling from $>$ 100 to 0·2–1·0 min as r.h. increases from 30 to 60%. Differences in individual samples are attributed to differing processing conditions. In contrast, the antistatic-treated samples exhibited a much smaller reduction in half-life with increase in r.h., an increase from 30 to 60% r.h. reducing the half-life from 0·10 to 0·03 min. Individual treated samples did not exhibit any notable differences. Data on the variation of maximum field strength of the polyester samples with changes in r.h. shows that an increase in r.h. of 30–60% has little effect in the case of untreated polyester, and that only above 60% is an appreciable drop in max. field strength detectable. With treated fabric, however, the max. field strength is strongly dependent on the relative humidity, falling steeply with increase in r.h. from 30 to 60%.
I.G.L.

Studies of Crease-resist Finishes for Cotton Textiles. III—Accelerated Storage Test for "Wash-and-Wear" Cotton Fabrics
R. L. Arceneaux, G. A. Gautreaux, R. M. Reinhardt, and J. D. Reid *Amer. Dyestuff Rep.*, **50** (6 Mar 1961) 163–166

An accelerated test procedure to determine the effect of storage on "wash-and-wear" cotton fabrics was developed. Fabrics finished with dimethylolethyleneurea, urea–formaldehyde, dimethylolethyltriazone, dimethylolhexahydropyrimidinone, or methylated methylolmelamine as finishing agents, each with three different catalysts, were stored for 16 h in sealed jars at 60°C and 100% r.h. The effects produced were comparable to those of prolonged normal storage. Optimum test conditions were established by determining the effect of storage time and temperature on fabrics finished with dimethylolethyleneurea and zinc nitrate catalyst.
S.B.D.

Determination of Carbonyl Groups in Hydrocellulose
K. Christofferson and O. Samuelson *Svensk Papperstidning*, **64** (31 Mar 1961) 195–197 (*in English*)

Complete reaction of the carbonyl groups is obtained with the Geiger–Wissler method only when the samples have been subjected to comparatively mild hydrolysis. The modification suggested by Wennerblom, in which acethydrazide pyridinium chloride (Girard's reagent P) is used, is incomplete with samples subjected to prolonged hydrolysis. It is concluded that the accessibility of Girard's reagent to carbonyl groups decreases as hydrolysis is prolonged.
R.A.

Influence of Lactones upon the Determination of Carboxyl Groups in Cellulose
O. Samuelson and B. Törnell *Svensk Papperstidning*, **64** (31 Mar 1961) 198–203 (*in English*)

The calcium acetate method of Sobue and Okubo gives appreciably lower values than the Samuelson–Wennerblom method owing to the presence of lactones which are not saponified by the calcium acetate. Alkaline pretreatment increases the calcium uptake, especially for samples of high carbonyl content. Acid pretreatment lowers the calcium uptake as a result of lactone transformation, which is confirmed by the hydroxylamine content. R.A.

Anthraquinone and Anthrone Series. XXV— Constitution of Nitrated Dibenzanthrone (IV p. 323)

Metal Chelates (IV p. 323)

Fluorescent Brightening Agents: their Photodecomposition in Aqueous Solution and on Substrate, and Photo-tendering Activity for Cellulose (IV p. 324)

Effect of Weathering on Properties of Textile Fibres— V (VI p. 330)

Effect of Light on Cotton and other Cellulosic Fabrics (VI p. 330)

Location of Resin Finish in Viscose Rayon Fabrics (X p. 339)

Permanent Antistatic Finishing of Highly Bulked Polyacrylonitrile Yarn (X p. 339)

XV— MISCELLANEOUS

Distribution of Fluorescence from a Disc-shaped Cuvette
W. H. Melhuish
J. Opt. Soc. Amer., **51** (Mar 1961) 278–279

The experimental procedure is described for the measurement of the angular dependence of the fluorescent flux from a disc-shaped cuvette. Results for a solution of quinine bisulphate in N H_2SO_4 are found to deviate from those expected according to the theoretical equation of Gilmore, Gibson, and McClure, even if the back and sides of the cuvette are painted black, when the results show better agreement with theory. It is suggested that the measurement of fluorescence efficiencies should be made with painted cuvettes so as to avoid errors due to back reflections. E.Coates

Munsell Value/Surface Reflection Relationships
J. Longmore and P. Petherbridge
J. Opt. Soc. Amer., **51** (Mar 1961) 370–371

Formulae are considered whereby surface reflectance (R) can be calculated from the Munsell value (V) and *vice versa*. For the purpose of architectural colour specification the following simple, and yet sufficiently accurate, relations are suggested; $V = R^{\frac{1}{2}} + 0{\cdot}5$ and $R = V(V-1)$. E.Coates

Apparatus to Count Tracer Radioactivity in a Running Thread
F. J. Hybart, P. F. Clemo, D. Davey, and C. D. Gibson
J. Textile Inst., **52** (Mar 1961) T122–T125

A method is described for continuous counting of low-energy radioactive emissions from a running threadline to which radioactive tracers have been added. The construction and calibration of the apparatus and the procedure for a measurement are described. W.R.M.

Consumer Complaints— A Source of Information for Producers
S. L. Myers *Amer. Dyestuff Rep.*, **50** (6 Mar 1961) 167–170, 189–190

Only a small proportion of the textiles returned as complaints to stores actually undergo laboratory testing. Separation of the complaints into "justifiable" (i.e. the fault is traceable to inherent defects in the garment construction, finish, or dimensional stability, or to defects in its component parts) or "unjustifiable" (i.e. the fault is traceable to the misuse or abuse of the garment by the consumer in use, care, or storage) can vary according to the standards set by the various laboratories. Thus for 1953, taking seven laboratories, the justifiable complaints averaged 42%, covering the range 36–53%. Of these colour failure constituted nearly 50%, fabric damage about 33%, with dimensional instability and damage to finish sharing the rest. The unjustifiable complaints fell into two groups, 33% due to faulty drycleaning and 67% directly attributable to the consumer. Of the latter over 33% were due to stains, nearly 33% were due to fabric damage from chemicals or heat, and about 22% to colour failure, mainly from chemicals. S.B.D.

Numerical Evaluation of Statistical Experimental Data by the Box-Wilson Method with the Use of the Electronic Computer IBM 650
J. Haller, G. Nussberger, and B. Messikommer
Helv. chim. acta, **44** (15 Mar 1961) 461–470

Statistical design and planning of experiments by the title method is briefly reviewed, and the automation of the associated calculations by an electronic computer then described. The main elements in setting up the programming sequence are itemised and developed in detail. A numerical example illustrates evaluation by computer and the advantages obtainable of speed, reliability, and flexibility in choice of experimental design. H.H.H.

PATENTS

Colouring Mineral Granules
Minnesota Mining & Manufacturing Co.
USP 2,943,002 (11 May 1959)

Mineral granules are coloured fast to weathering, abrasion, and blooming by heating them to 90–180°F and then mixing them with an aqueous slurry containing anhydrous aluminium silicate, pigment, and a water-soluble alkali silicate as binding agent. Toward the end of mixing air is passed through the mixing apparatus to partly dry the coated granules. Drying is then continued with a minimum of agitation at 400°F. C.O.C.

Making Feathers Water-repellent, Resistant to Microbiological Attack, and Permanently Curled
U.S. Secretary of the Army
USP 2,937,918–20 (23 Apr 1957)

The feathers are cleansed and treated in 1% aq. Na_3PO_4 at 43–49°C for $\leq$ 10 min. They are then treated with either (*a*) acrylonitrile in dioxan for 90 min at 44–49°C, dried and cured at 86–88°C for 10 min, or (*b*) an aq. soln. of 1,4-benzoquinone for 1 h at 30–37°C and pH 4·5–5·5, neutralised and dried, or (*c*) an aq. soln. of *N*-methylol-acrylamide for 90 min at 42°C and pH 10·0–10·1, the solution then brought to pH 6·8 and treatment continued for 30 min, followed by rinsing and drying. Alternatively the phosphate treatment may be replaced by treatment with aq. 0·1% hydrazine at pH 8 and 35°C for 15 min, in which case subsequent treatment is with aqueous acrylonitrile at pH 10–11 at 38–42°C for 90 min, followed by neutralisation and curing for 10 min at 89–91·5°C. C.O.C.

Importance of Odour Control in Textile Processing (X p. 338)

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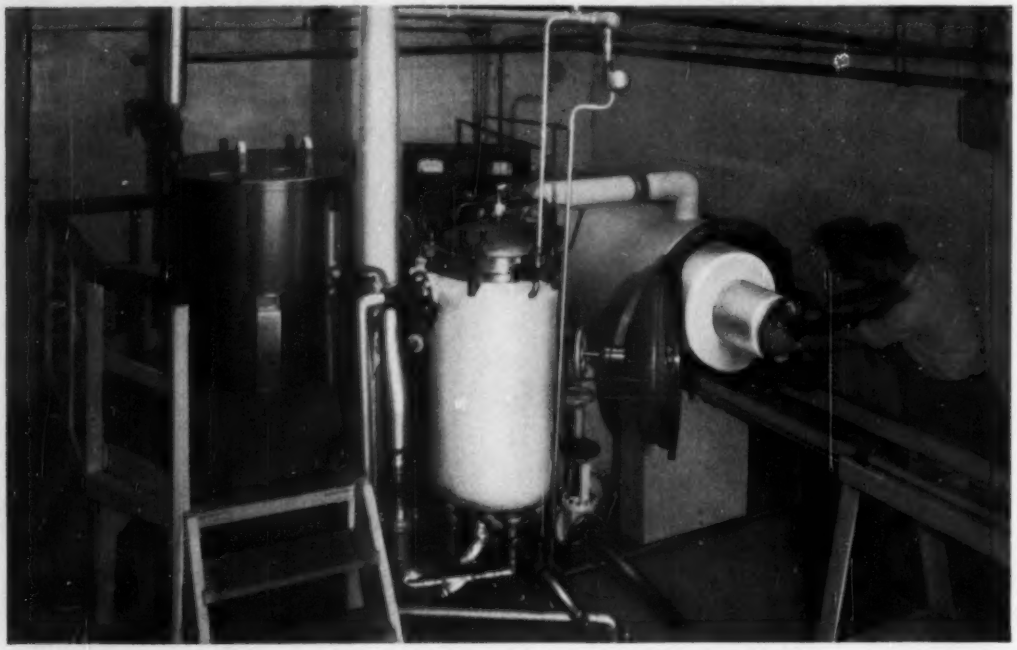

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The Division, one of three constituting the Wool Research Laboratories, is broadly concerned with development of new physical and chemical techniques in wool textile processing and provides well equipped laboratories for fundamental studies and full scale mill equipment for application of results. The wide field of research include absorption studies on wool, fibre friction, permanent setting, shrinkage prevention, mechanical action of machines on wool fibres, servo-control mechanisms in processing and development of new machines.

The appointees will carry out duties in the following fields—

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(ii) The development of new physical methods for separating vegetable material from wool;

(iii) Physical studies on fibre friction, and the effects of lubricants;

(iv) Investigation of new methods of yarn production;

(v) Fibre behaviour in processing using radioactive and high-speed photographic techniques.

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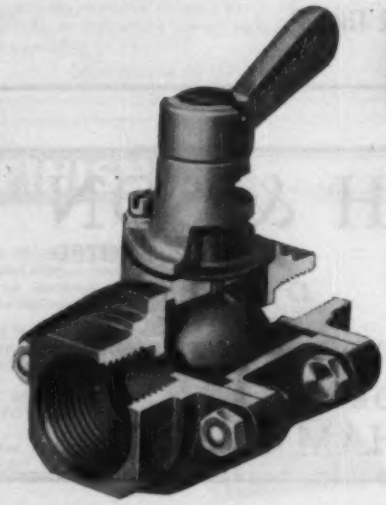

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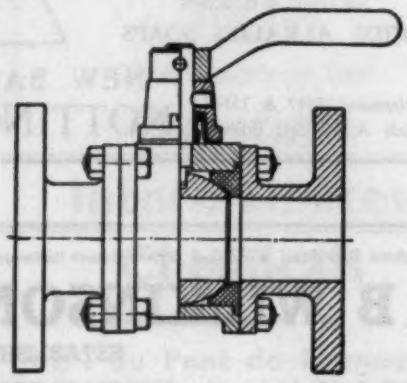

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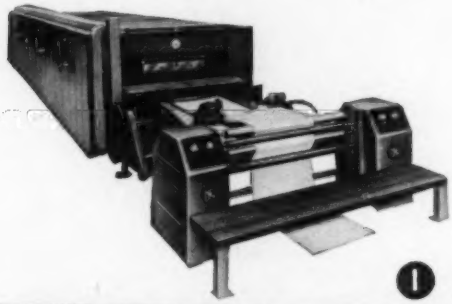

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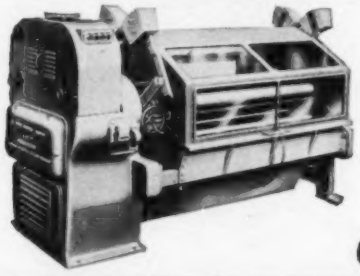

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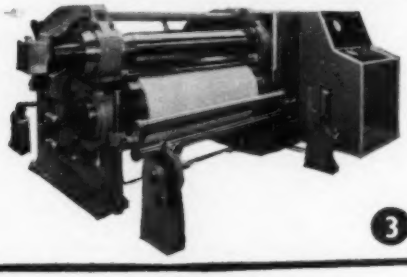

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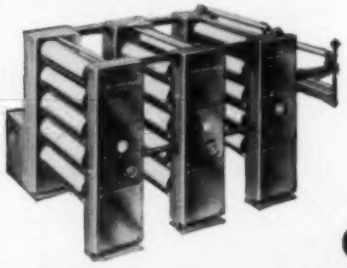

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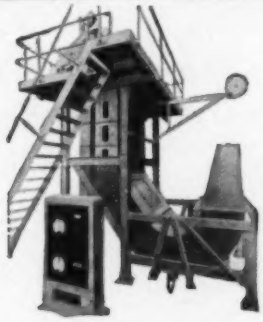

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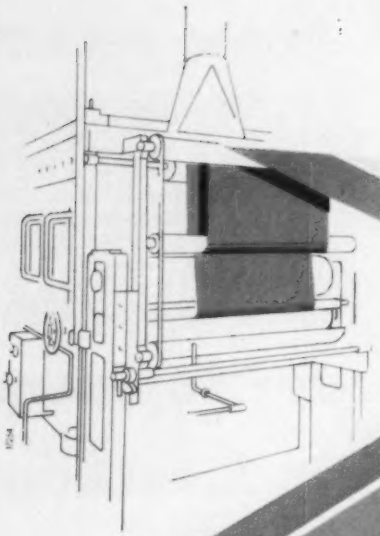

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